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Italo: the Pathfinder Experience of the Competition in the High-Speed Rail Passenger Market. The Keys to Success

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Jacob Trepat Borecka

Cover picture: Frecciarossa and Italo trains at Milan Central.
Source: @milanotrasporti.

Abstract

The deregulation of rail transport and the opening of the market to competitors in the European Union have brought in Italy the very first competition in the high-speed rail market between two operators, induced by a new private open-access operator named *Italo* competing since 2012 with the incumbent state-owned operator, which is seen as a test case for other countries that will fully open to competition as of 2020. The aim of this dissertation is to examine *Italo*'s experience in order to identify the key points that may be worth considering for the setting up of a similar operator in Spain.

Firstly, the context of the liberalisation of rail transport in Europe is introduced and followed by a brief review of the few instances of actual rail competition in the market. Subsequently, the study is focused on the Italian case through a comprehensive examination of its high-speed rail network and an introduction to the newcomer *Italo*, covering all aspects that characterize the company in terms of business and service.

The fieldwork later developed consists of an overview of the company's strategy, financial results and position in the market in order to indentify the keys of their accomplishments. Taking into account that *Italo* is just a component of a transport system that has considerably changed since the advent of rail competition, it is convenient to review its impact from a wider point of view of the system. Finally, based on the results obtained, an indicative instruction manual for the launch of a similar high-speed rail competitor intended to operate in Spain has been elaborated.

The research carried out evidenced the many factors that have favoured rail competition in Italy especially in terms of the role of the Government in promoting so and the infrastructure made available, the factors that determined the success of the newcomer from a commercial and financial point of view, the significant effects of the new rail competition regime on the overall long-distance transport system and finally some considerations on the feasibility of rail transport competition.

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Abbreviations and Terminology

AC Alternating current.

ADIF *Administrador De Infraestructuras Ferroviarias* (Rail Infrastructure Manager).

AGV *Automotrice à grande vitesse*.

ANSF *Agenzia Nazionale per la Sicurezza delle Ferrovie* (National Railway Safety Agency).

ASK Available Seat Kilometre: indicator typically used in air and rail transport measuring the sum of kilometres travelled by the total number of seats offered.

AV/AC *Alta Velocità/Alta Capacità* (high-speed/high-capacity).

AVE *Alta Velocidad Española*. Denomination of high-end, high-speed train passenger services operating in Spain.

CASK Cost per Available Seat Kilometre: indicator typically used in air and rail transport measuring the ratio between operating expenses and offered seat kilometres (ASK).

CNMC *Comisión Nacional de los Mercados y la Competencia* (National Commission of Markets and Competition).

DC Direct current.

EBIT: financial indicator denoting earnings before interest and taxes.

EBITDA: financial indicator denoting earnings before interest, tax, depreciation and amortisation on tangible and financial assets and on securities held as current assets as well as amortisation on goodwill from equity method investments.

EEC Energy Efficiency Certificate: documents certifying that a certain reduction of energy consumption has been attained.

EMU Electric Multiple Unit.

ENAC *Ente Nazionale per l'Aviazione Civile* (Italian Civil Aviation Authority).

ERTMS European Rail Traffic Management System.

ETCS European Train Control System.

EU European Union.

FS *Ferrovie dello Stato Italiane S.p.A*.

GDP Gross domestic product.

HSL High-speed line.

HSR High-speed rail.

HST High-speed train.

IPO Initial Public Offering, or Stock Market Launch.

Load Factor Indicator typically used in air and rail transport measuring the capacity utilization of public transport as the ratio between the number of passengers transported and the number of seats available (RPK/ASK). It is generally used to assess how efficiently a transport provider fills seats and generates fare revenue.

LZB *Linienzugbeeinflussung* (Signaling system).

NTV *Nuovo Trasporto Viaggiatori S.p.A*.

PSO Public service obligation.

RASK Revenue per Available Seat Kilometre: indicator typically used in air and rail transport measuring the ratio between fare revenue and offered seat kilometres (ASK).

RENFE *Red Nacional de los Ferrocarriles Españoles* (Spanish national railway company).

RFI *Rete Ferroviaria Italiana S.p.A*. (Italian Railway Network).

RFIG *Red Ferroviaria de Interés General* (National railway network).

ROSCO Rolling-stock operating company.

RPK Revenue Passenger Kilometre: indicator typically used in air and rail transport measuring the sum of kilometres travelled by the total number of passengers. It reflects traffic better than ridership.

SCMT *Sistema Controllo Marcia Treno* (Train Speed Control System).

SNCF *Société Nationale des Chemins de Fer Français* (French national railway company).

SpA *Società per Azioni* (Joint-stock company).

TGV *Train à Grande Vitesse*.

Train-km Rail transport indicator corresponding to the total number of kilometres travelled by certain trains in a given period of time, used to measure the service supply.

UIC International union of railways.

White Certificates See EEC.

Yield Indicator corresponding to the ratio between the fare revenue and RPK.

Yield management Variable pricing strategy aimed at maximizing revenue. It involves strategic control of inventory to sell the right product to the right customer at the right time for the right price.

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1

Introduction

1.1 Motivation

As a response to the rail transport decline in the second half of the 20th century, the European Union has persevered in promoting competition in this sector since the 1990s as the core intervention to revert this unfavourable situation and to significantly improve railway competitiveness, trying to follow the predecessor success of air transport deregulation. Therefore, rail transport competition is called to be one of the new revolutions in the scope of transportation.

Nevertheless, the intrinsic characteristics of rail transport have made the progress of the deregulation process much slower than it was in air transport. In fact, in 2018, only a few open-access operators compete in the passenger transport market in a few European countries, specifically in Austria, Czech Republic, Germany, Italy and Sweden.

The most relevant example of liberalisation in terms of traffic carried is definitely *Italo* S.p.A., an Italian company that operates in the field of high-speed rail transport in Italy, which is in fact the very first private operator competing in this field with the incumbent, state-owned company. Despite its initial difficulties, *Italo* has already achieved a 35% traffic share in the routes where they operate with up to 84 daily services (May 2018) and it is rapidly growing thanks to the undergoing expansion of the fleet and the network.

While it is yet to be seen to which extent passenger rail transport competition is actually feasible, full liberalisation of passenger rail transport will be effective by the end of 2020 and the Spanish rail sector is currently preparing for this upcoming new setting, with competition presumably focusing initially on high-speed rail. Therefore, it is of the greatest interest to assess the pioneer Italian experience in this field in order to indentify the key points that may be worth considering for a similar framework in Spain and especially for the launch of a similar operator, particularly from the commercial, operational, financial and strategic points of view.

The final goal of the liberalisation of rail transport carried out by the European Union and the subsequent advent of competition in the sector is broadly to reform the overall transport system by improving rail competitiveness and therefore to promote it as a more efficient, sustainable and environment-friendly means of transport.

1.2 Aims

The goal of this document is firstly to examine thoroughly the Italian experience in the competition in the high-speed rail market through a wide range of aspects:

- Introduction to high-speed rail transport.
- The current context of rail transport competition in Europe, covering the background that motivated its execution, the new legislative framework in Europe and particularly in Italy, and the actual development of the new setting of rail transport.
- The characterization of the Italian high-speed rail network in terms of its history, its most relevant technical specifications, as well as its current traffic and services and other operational considerations deemed as relevant to the topic treated.
- The review of Italo's history, its business organization, its network, rolling stock and on-board service.
- The company's strategic management, financial results and growth opportunities.
- The outcomes of rail competition in Italy in terms of the impact in the overall long-distance transport system, on the high-speed rail service and on the response of the incumbent company to competition.

Secondly, as a synthesis, and based on the results obtained, an indicative instruction manual for the launch of a similar private open-access train company intended to operate in the Spanish high-speed rail network in competition with the incumbent, state-owned company Renfe will be established, with the preliminary considerations applicable to the Spanish case.

2

The European High-Speed Rail Network

2.1 Prior Definitions

According to the European Union Directive 96/48/EC, Annex 1, HSR is defined as the system consisting of rail infrastructure with minimum speed of 250 km/h on lines specially built for high-speed and of about 200 km/h on existing lines which have been specially upgraded, and the rolling stock specifically designed alongside its infrastructure to meet with the compatibility, safety and quality of service standards.

On the other hand, according to the UIC, HSR are systems comprised by infrastructure, station emplacement, rolling stock, operation rules, signaling systems, marketing, maintenance systems, financing, management and legal aspects.

2.2 Historical Perspective

During the second half of the 20th century, three global factors led to major changes on the transport sector in Europe and North America that have caused significant effects on citizens' daily life.

Firstly, a major development of road transport took place due to the improvement of the road network, the construction of a highway network and the fact that cars were increasingly affordable for most of the society as a result of technological and industrial development. Secondly, the air transport saw a considerable growth as well, marked by the introduction of jet planes. And thirdly, by contrast, the decadence of rail transport, with the closure of numerous railway lines throughout Europe.

The overlap of the three factors presented above led to some practical repercussion such as the increase in the accident rate, extra costs due to air congestion and the upgrowth of energy consumption in the transport sector as it is known that both air and road transport have a greater unitary energy consumption than rail transport.

In the middle of the 20th century, passenger rail transport was reaching its limits when it comes to maximum speed, normally not higher than 140 km/h. Considering the critical situation of passenger rail transport in Europe in those times, it was of the greatest interest of railway companies to explore higher speeds in order to maintain rail competitiveness against its competitors.

After the big success of the Japanese Shinkansen (launched in 1964, it was the very first HSR worldwide), several European countries developed new technologies and innovations aimed at introducing high-speed in Europe. Indeed, the French experience in the 1950s with powerful electric locomotives reaching the incredible speed of 331 km/h for the very first time in history proved the need to develop a new infrastructure and rolling stock

specifically designed to safely operate at the so-called high-speed, which would require many years of intense work.

Finally, in 1974, the French government approved the construction of a HSR line that would link Paris and Lyon, and hence serving all southeastern France. The first section of the new infrastructure was opened in 1981, becoming the first HSR line in operation in Europe and establishing an important milestone in the European rail transport history.

After its big success, other European countries joined the group of countries offering HSR services in Europe, such as Germany in 1991 (Hanover-Würzburg and Mannheim-Stuttgart), Spain in 1992 (Madrid-Sevilla), Belgium in 1997, the United Kingdom in 2003 and the Netherlands in 2009. Some of them developed its own technology while others imported it. In April 2007, an experimental TGV train broke the world speed record reaching 574,8 km/h on the Paris-Strasbourg HSL.

In 2015, HSR lines in the world extended over almost 30.000 kilometres. HSR has become a key transport infrastructure for the development of territories that generates a completely new socioeconomic context when it comes to offer and demand. Its importance is the main reason that justifies aids of the European Union for the financing of HSR network which, together with other important transport infrastructures, constitutes the Trans-European Transport Network (TEN-T).

For the development of HSR systems, it has to be taken into account that a very advanced infrastructure and rolling stock capable to operate at very high-speeds in conditions of safety and comfort is essential, in addition to advanced security systems for the train operation control, compunctious maintenance tasks, intermodal stations, cadence schedule and the appropriate marketing in order to attract the largest possible number of users. It is clear that the implementation of HSR is almost equivalent to the deployment of a new means of transport from zero and that extremely high investments are required in order to materialize it.

2.3 Advantages of High-Speed Rail

The benefits of HSR from the society and global transport system points of view include the following:

- High transport capacity. It is worth noting that the capacity of a double-track HSL is significantly higher than a 6-lane highway (3 lanes each way) while requiring approximately only one third of the land.
- Reduction of traffic congestion and road accidents.
- Respect of the environment through the efficient use of land -which is very relevant in densely populated areas-, energy efficiency and the reduction of the emission of greenhouse gases and carbon dioxide.

- Spatial coverage of the territory: ability to serve multiple stops, as trains spend only a few minutes stopping at intermediate stations.
- Help to the economic development.

On the other hand, the main benefits of HSR for passengers can be summarized as follows:

- Commercial speed typically in the 180 to 250 km/h threshold and hence shorter travel times from door to door.
- High frequency. Total travel times are assumed to include half the headway.
- Reliability: less prone to delays.
- HSR services are less dependent on weather conditions than road or air transport as it may be only affected by severe weather conditions.
- Accessibility: stations are usually located in city centers and passengers can board trains just a few minutes before departure, without long check-in times.
- Highest comfort standards among all long-distance means of transport: there are no abrupt accelerations and decelerations, no seatbelts, no annoying noises, significant spatial comfort (greater legroom, seat width, etc.), no bans on the use of electronic devices and freedom of movement inside the train.
- Safety.

2.4 The Current European High-Speed Rail Network

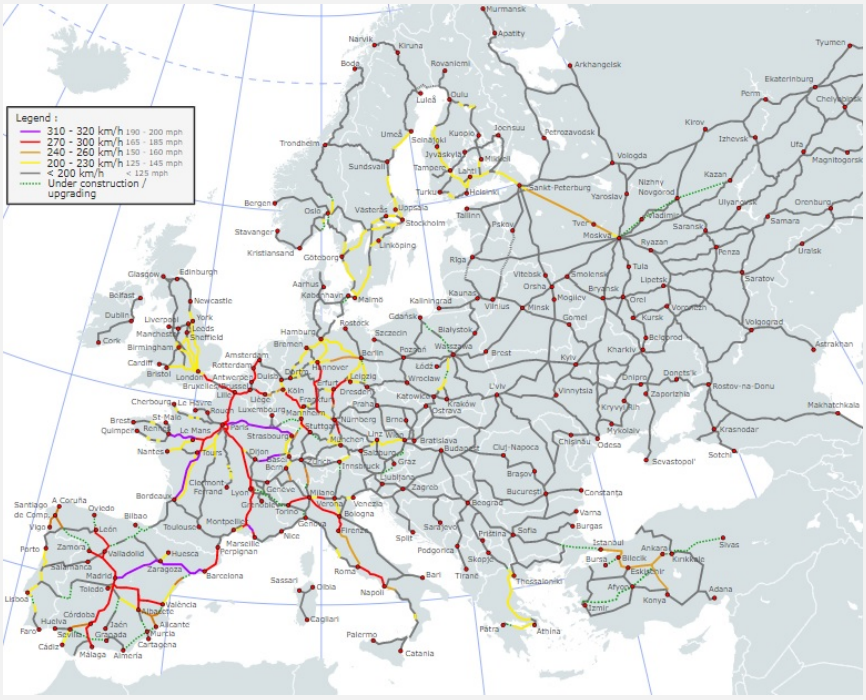
The current extension of HSR in Europe is summarized below (Table 1 and Exhibit 1).

Table 1 | High-Speed Lines in Europe

Country	In operation (km)	In construction (km)	Planned (km)	Total (km)	Maximum speed (km/h)
Spain	2.852	904	1.061	4.817	310
France	2.776	0	0	2.776	320
Germany	1.658	185	0	1.843	300
Italy	896	53	0	949	300
Russia	0	0	770	770	250
Poland	224	0	484	708	230
United Kingdom	113	230	320	663	300
Austria	244	243	24	511	250
Belgium	209	0	0	209	300
Switzerland	144	15	0	159	250
Netherlands	120	0	0	120	300
Denmark	0	56	0	56	
Sweden	0	11	0	11	
TOTAL	**9.236**	**1.697**	**2.659**	**13.592**	

Source: UIC. Updated 1 April 2018.

Exhibit 1 | Map of the European High-Speed Rail Network.



Source: Wikipedia.

2.5 Future Perspective

According to 2015 expectations, and in spite of the development of other transport modes (for instance the Maglev, automatic driving cars and improvements in aviation among others), the extension of the world HSR network could reach more than 80.000 kilometres by 2030-2035, representing an important challenge for operators, industry, authorities, etc. High speed must be continuously developed and performed in order to continue to be present in passenger transport in the next 50 years (or more) (International Union of Railways, 2015).

2.6 Overview of some Technical Aspects of High-Speed Rail

2.6.1 General Specifications

The main adjustments in the HSR infrastructure specifications include the adoption of very large curve radius, a greater distance between tracks, wider tunnel sections, electrification at very high tension and fences along the entire line. Regarding driving systems, traditional signalling is replaced by sophisticated automatic on-board systems and, as for the rolling stock, traditional locomotive carrying passenger cars compositions are replaced by electric multiple units either with two power cars at each end or with distributed traction along the train. Despite these differences with respect to conventional rail, the European HSR system is designed to be compatible with it so that high-speed trains can usually operate on both networks.

2.6.2 Maximum Operating Speed

The maximum operating speed used to be set at 300 km/h, but trains operate at 320 km/h in some French lines and also some trains operate at 310 km/h in a 60 km long stretch of the Spanish Madrid-Barcelona HSL. Additionally, Italy hinted at raising top speed of certain trains to 350 km/h in part of the network.

2.6.3 Considerations on the Optimum Travel Time of HST Services

Despite the maximum speed of commercial HST services is lower than that of jet aircraft, the total travel time turns out to be lower for short distances (let us assume less than 800 km) as they typically connect city centre train stations, while air transport connects two airports that are usually away from city centres and require long check-in times. HSR is generally best suited for journeys in the 1 hour to 4 hours and a half threshold. Nevertheless, there are a high number of HST services with travel times longer than 4 hours and a half in Europe and these considerations indeed depend on a wide range of factors.

3

Rail Transport, Monopoly and Competition

3.1 Background of Rail Transport Operators

The earliest railways in the European countries were often run by private entrepreneurs. Nevertheless, this situation changed progressively during the first half of the 20th century due to the widespread tendency towards nationalization.

In Spain, for instance, the major private companies were already facing a decline in profitability before the Spanish Civil War, and after the contention, the national rail network was devastated and therefore the companies went bankrupt. This situation forced the intervention of the Government in the major companies, which later resulted in the creation of RENFE in 1941 with the aim to nationalize all broad gauge railways, following a trend already common in other European countries which had to face a comparable situation with regard to severe financial difficulties.

The fact is that nowadays rail transport as a public service requires large amounts of resources to be run and to fund new investments, and furthermore the vast majority of urban and regional services, which account for a very large portion of the total European rail traffic, require public financial support in order to be sustained (the so-called PSO). Therefore, these facts justify fairly well why governments take care of these issues.

Urban, local and narrow gauge railways as well as some specific secondary railways are usually transferred to regional governments and operated by minor companies, whereas the general interest mainline railways are responsibility of the state and are operated by the corresponding state-owned company.

More recently, the tendency has been towards privatisation, which allows to introduce a greater commercial and financial discipline and hence a better efficiency. Nonetheless, other countries such as the United Kingdom adopted mixed solutions with the nationalisation of the infrastructure and the privatisation of operations.

Domestic HSR services have always been operated by these national companies as a market unit of their rail transport operations (Table 2). The only exception to this fact is the private Italian HSR operator NTV, which started its operations in 2012, made possible by the liberalisation of rail transport in Italy. On the other hand, international HSR services are operated by consortia of public companies from the countries where they operate (Table 3).

3.2 The European Legislative Framework towards Rail Transport Competition

Once introduced the common organization of rail transport operation, it is necessary to address the setting-up of the rail competition framework, covering the reasons that

motivated the European Union to make it possible, the legislative framework setup, its implementation and an insight into the current situation in the new stage of rail transport.

Table 2 | Major Rail Operators in Some European Countries.

Operator	Country	Founded
British Rail (BR)	UK	1948 (*)
Comboios de Portugal (CP)	Portugal	1951
Danske Statsbaner (DSB)	Denmark	1885
Deutsche Bahn (DB)	Germany	1920 (*)
Iarnród Éireann (IE)	Ireland	1945 (*)
Nederlandse Spoorwegen (NS)	Netherlands	1938
Norges Statsbaner AS	Norway	1883 (*)
Österreichische Bundesbahnen (ÖBB)	Austria	1923
Polskie Koleje Panstwowe (PKP)	Poland	1926
Renfe Operadora	Spain	1941
Schweizerische Bundesbahnen (SBB CFF FFS)	Switzerland	1902
Société nationale des chemins de fer belges (SNCB)	Belgium	1926
Société nationale des chemins de fer français (SNCF)	France	1938
Statens Järnvägar (SJ)	Sweden	1887 (*)
Trenitalia	Italy	1905 (*)
VR-Yhtymä Oy	Finland	1862

(*) Foundation of the predecessor.
Source: own analysis.

Table 3 | European International HSR Operators.

Operator	Owners	Founded
Allegro	VR and Russian Railways	2010
Alleo	DB and SNCF	2007
Artesia [1]	SNCF and Trenitalia	1995
Cisalpino [2]	SBB and Trenitalia	1993
Elipsos	Renfe and SNCF	2001
Eurostar	SNCB, SNCF and Eurostar Ltd [3]	1990
Fyra	NS International [4] and SNCB	2009
Lyria	SBB and SNCF	1993
TEE Rail Aliance	DB, ÖBB and SBB	2000
Thalys	DB, SNCB and SNCF	1993
Thello	Trenitalia	2011

[1] Defunct in 2011.
[2] Defunct in 2009.
[3] Eurostar Ltd was a subsidiary of London and Continental Railways.
[4] NS International is a joint venture of NS and KLM.
Source: own analysis.

Rail transport has traditionally evolved within the national borders and therefore each country created its own railway system. As a consequence, this lead to a structural fragmentation of the European railway system that is still one of the greatest barriers

towards the creation of a single European railway market, entailing severe issues in terms of efficiency, flexibility and reliability, especially for freight transport.

In the 1980s, the European Economic Community began to study possible interventions to brake the rail transport decline and subsequently initiated a regulatory reorganization aimed at overcoming those that were identified as the greatest obstacles to the development of rail transport (in particular the lack of a competitive market), and hence the creation of a single, efficient and competitive market for rail through Europe.

Airline deregulation in Europe in the 1990s allowed air transport to become more efficient and competitive, while rail transport still had to face many technical and administrative drawbacks to its development. Therefore, rail liberalisation aims at reproducing the essence of airline deregulation (with its pertinent differences). Nevertheless, rail deregulation has progressed much slower than air deregulation.

The basic choice of the CEE was the progressive abandonment of monopolistic management of the sector through a gradual process of deregulation involving freight transport first and then passenger transport; firstly international and then domestic. In relation to that, competition may be promoted while tackling barriers to market entry and harmonizing technical specifications, safety standards and certification.

Consequently, in 1991, the EU Directive 91/440 relative to the community railways was created, that in fact, through the accounting separation between infrastructure and services, should enable competition in rail transportation. This process is mandatory on the accounting level while it remains optional on the organizational level. Specifically, this law made it a legal requirement for independent companies to be able to apply for non-discriminatory track access on a European Union country’s track. Train operations can be undertaken by either public or private companies, but the infrastructure must be public owned. Nonetheless, competition is optional for regional and urban passenger transport.

In addition to the 1991 directive, other directives (the so-called Railway Packages) have been approved over the years, which have expanded railway liberalisation to the current situation. Firstly, in 1995 the EU Directive 95/19 on the allocation of railway infrastructure capacity and the charging of infrastructure fees was created.

However, this directive was replaced by the introduction of the First Railway Package in 2001 (a collection of EU legislation), which allowed the beginning of the intense process of liberalisation of the sector with the following agreements:

- Introduction of the principle of regulation of payment for access to the network and the regulation and allocation of access rights.
- Regulation of the issue, extension and modification of licenses for railway undertakings.
- Identification of a subject or an authority to deal with the allocation of train slots according to principles of fairness, non-discrimination, effectiveness and efficiency.
- Identification of the requirements to configure certain companies as railway undertakings and the procedures to be followed for the allocation of the tracks by the network operator.

One of the most innovative elements is the introduction in the European railway systems of the system of access fees to the network. It is precisely this regime that must allow in fact a large liberalisation, allowing the use of networks by a multiplicity of operators, national and foreign, in competition with each other. Furthermore, it allows the infrastructure manager the coverage of at least a part of their costs, giving governments the possibility to reduce the amount of subsidies allocated each year significantly.

As it can be appreciated, it took over ten years from the 1991 directive for the railway market to effectively begin to open. Indeed, these processes in rail transport are usually slow and tend to encounter many obstacles.

In 2001, the European Commission elaborated the White Paper on Transport “Roadmap to a Single European Transport Area - Towards a competitive and resource efficient transport system”, establishing the future legal actions towards the revitalization and acceleration of the integration of the railway sector. The main provisions focused on a new organization of freight and passenger transport, a new transport policy, the harmonisation of the competition conditions and an improved safety.

In 2004, the Second Railway Package was approved, covering the following issues:

- Security of the European rail system.
- Further developments to guarantee the interoperability of the system.
- Allowance for open access for freight services, nationally and internationally, starting in January 2007.
- Establishment of a European Railway Agency to coordinate safety and interoperability efforts.

The Third Railway Package, approved in 2007, aims the following:

- Open access for all international passenger services, including cabotage, across the railways of the EU starting in January 1st, 2010.
- Introduction of certain rail passenger rights including assistance and a minimum level of compensation for delays, aiming to establish quality guarantees.
- Harmonization of train driver licenses.

In September 2010, the process of merging the directives into a single piece of legislation began with the addition of modifications to strengthen the regulatory framework.
The Second Railway Package and the Third Railway Package aimed to push integration further. Hence, the Single European Railway Directive 2012 was established.

The Fourth Railway Package, with the aim to make rail transport competition possible, is divided in two sections: the technical pillar and the market pillar. The first of them was adopted by the European Commission and approved in April 2016, whereas the market pillar is to be launched in January 2019, with permission for new entrants to start operating train services by the start of the winter timetable in December 2020. This set of changes cover the following issues:

- Standards and authorization for rolling stock, workforce skills, independent management of infrastructure.

- Liberalisation of domestic passenger services in an attempt to reduce European rail subsidies.
- Permission for tracks and trains to be owned by a single holding company.
- Shift of the responsibility for authorizing rolling stock to use a network from network owners and towards the European Railway Agency.

The restructuring of national railways requires the redefinition of the role of the government. The different models for the introduction of competition requires a government committed to play a new role in the railway industry: promote and enforce competition, limiting the regulatory tasks to protect consumers from monopoly abuse (when competition is not feasible or undesirable), and to guarantee fair competition between different operators, leaving productive decisions to the private sector (Beria et al., 2010).

Overall, the rules vary according to whether it is freight transport, international passenger transport or national passenger transport. Regarding passenger transport, the models of competition applicable during the liberalisation of the market can be traced back to two cases: "competition for the market", that is the competition between several subjects to access a market that, once conquered, is temporarily managed exclusively by those who prevailed, and "competition in the market", i.e the presence of two or more operators competing on the same market.

3.3 The Italian Legislation Towards Rail Transport Competition

At the national scale, two are the relevant facts to refer to: the first of them was the Legislative Decree n. 146 of March 1999 for the implementation of the European directives that allowed the beginning of freight transport competition in Italy in September 2001. And secondly, the Law 388/2000 (the so-called *Legge Finanziaria 2001*) that in the article 131 has introduced in Italy (ahead of the rest of Europe) the competition in the domestic transport of passengers.

Since 2004, European legislation has liberalised international and domestic rail travel for freight and passengers, but there still is no obligation under European Union law to open domestic services to market competition as Italy did, hence different degrees of openness have been reached among European countries (Pianigiani, 2012).

3.4 Record of the Deregulation of Rail Transport

3.4.1 The Institutional and Economic Relationships among Actors

In Italy and Germany, the actual separation between infrastructure operator and service operator is wider than in other European countries such as Spain or France. By contrast, Sweden and the United Kingdom are in a more advanced stage compared to the former four countries. However, both in Italy and Germany the network manager is still part of a public holding, together with the train company, whereas France recently moved back to a similar structure. In Italy, the owner of the FS Holding is the Ministry of Economy, while the responsibility of contracts and regulation is the Ministry of Transport. FS has the full control on RFI (the network manager) and Trenitalia (the service operator).

With regards to independent regulatory agencies, in Italy and Spain, the non-discriminatory access to network is controlled by the Ministry, which also has a role in deciding the toll level applied. Their main responsibilities include monitoring rail transport and resolving any disputes. In Germany and Italy there is also a second controlling subject: the antitrust authority, which has power to intervene in case of complaints by private companies.

Focusing on Italy, there is also the Network Information Prospectus (PIR), which is a document whose function is to regulate the relationships between railway companies and RFI. The PIR lists the specifications of the railway lines, facilities and the tariffs for using the railway infrastructure. Both Trenitalia and the various private operators operating on the railway lines are required to pay RFI the rights to use lines and services.

3.4.2 Market Access Conditions

With respect to market access conditions, Italy has a system of conditions for licensing less strict than in other countries such as France, Germany and Spain, as it is only necessary a declaration that the required characteristics and certifications will be present at the moment of starting operation and not at the moment of the request. On the other hand, when it comes to access conditions to slots, services and terminals, the fixed assets in Italy are generally owned by RFI and open to new entrants.

3.4.3 Licensed Operators and Market Shares

The available data show that in Italy, 16 operators provided actual service (2006) out of a total of 49 licensed operators in 2008, with less than 1% passenger market share (2009) and 13% freight market share (2008) (FS and the European Commission). Competition on passenger market was clearly not relevant, although it significantly arose with the entrance of NTV S.p.A. in the market in 2012. On the other hand, freight market competition was actually already considerable in the cross-alpine market, with a 30% share.

3.4.4 Regulation of PSO

Finally, it is worth making a few comments regarding social and market services and their regulation. In European countries, all regional services are commonly considered as PSO, which are the so-called social services, and hence worth subsidizing. By contrast, long distance services and freight services are usually classified as market services (thus it cannot be subsidized). Nevertheless, in France and Italy, some long distance services are subsidized and even freight is subsidized in some cases in Italy.

An unclear relationship between social and market services is a source of distortions. In particular, the way in which unprofitable not-subsidized services are maintained for political reasons as social services, determines the existence of cross-subsidization. Cross-subsidization, in the general definition, is a problem because a monopolistic unregulated market generates profits that may be used to dump on other markets: profitable monopolistic services can be used to lower the price of other non-monopolistic services, causing unfair competition on the latter market.

Cross-subsidization is mainly undertaken from profitable to non-profitable services and typically seen in the long distance segment, as it happens in France, Italy and Spain. German railways managed to separate effectively profitable and unprofitable services instead by shifting them under the regional segment or cutting them. Hence, the theoretical solution to this balance problem (particularly while facing competition) is to move social services away from those hidden segments and subsidizing them explicitly.

3.5 Situation in 2018

Currently, there is a fairly large number of open access passenger operators competing for regional and local markets, granted and subsidized by public administrations: about 40 operators in Germany, 3 in Denmark, 1 in the Netherlands, 1 in Portugal, 4 in the Czech Republic, 6 in Sweden, 30 in Switzerland, a dozen in Austria and a few in Italy, Poland and Romania. However, with respect to competition in the market, the number of operators is much smaller (Table 4).

A couple of things should be noted regarding the list in Table 4 below. First of all, that the number of competing open-access operators in Europe and their sizes is quite limited. In general, only a new entrant competes with the incumbent operator. The only exception is the Prague-Ostrava link, which became in 2012 (and still to date) the only case in the world in which three operators compete simultaneously. Secondly, that competing operators generally focus on long-distance (non-subsidized) markets. Thirdly, all operators have focused in the routes with the highest demand in the country, which are usually those that have the best technical performances.

Table 4 | European Open-Access Passenger Operators in Competition with National Operators.

Operator	Country	Started operations	Routes operated	Fleet size
WESTbahn	Austria	2011	Vienna-Linz-Salzburg	17
LEO Express	Czech Republic	2012	Prague-Ostrava-Košice, Prague-Brno-Vienna/Bratislava	7
RegioJet	Czech Republic	2011	Prague-Ostrava-Košice/Kraków, Prague-Staré Město u UH	17
DB-ÖBB EuroCity [1]	Germany/Austria	2009	Rome/Bologna/Venice-Verona-Munich, Rome/Venice-Vienna	-
FlixTrain [2]	Germany	2018	Hamburg-Cologne, Berlin-Hanover-Frankfurt Main-Stuttgart	-
Hamburg-Köln-Express [3]	Germany	2012	Hamburg-Cologne	1
Locomore [4]	Germany	2016	Berlin-Hanover-Frankfurt Main-Stuttgart	1
Arenaways [5]	Italy	2010	Turin-Milan	-
Nuovo Trasporto Viaggiatori	Italy	2012	Venice/Verona/Turin-Milan/-Rome-Naples-Salerno	36
MTR Express	Sweden	2015	Stockholm-Gothenburg	6
Snälltåget	Sweden	2009	(Åre)-Stockholm-Malmö-(Berlin)	-

Note: fleet size accounts for the number of unit trains (updated in May 2018).
[1] Since 2011, they are not allowed to perform cabotage in Italy.
[2] FlixTrain took over HKX and Locomore suspended links in 2018.
[3] HKX suspended operations in October 2017.
[4] Locomore filed for insolvency in May 2017 and suspended operations. LEO Express took over operations on August 2017 and relaunched services together with FlixBus.
[5] Arenaways failed in 2011.
Source: own analysis with data from different sources.

Based on these experiences, passenger rail competition has brought a drastic reduction in the ticket price (in the routes with competition) and, as a result, a strong growth of demand. Nevertheless, in some cases, part of this growth is due to other factors such as the improvement of the rail infrastructure or the lower convenience of other means of transport.

Even though competition has brought clear advantages for users, it has some drawbacks for the whole system. For instance, it is believed that it may lead towards a higher cost per user and a less efficient use of the infrastructure, and in some cases the increase in the overall system cost can outweigh the efficiency benefits of competition. For instance, competition forces railway companies to adjust prices where there is competition and to increase prices where there is none, causing the deterioration of services in other lines.

With respect to Italy, the most relevant example of liberalisation is definitely Nuovo Trasporto Viaggiatori S.p.A., an Italian company that operates in the field of HSR transport. In fact, Italy is the very first country in which a private operator provides HSR passenger services in competition with the incumbent public operator (Trenitalia in this case) since 28th April, 2012, and therefore it is the only country in the world where there is true competition on HSR transport (*). This singular situation is indeed being seen as a test case for Europe.

On the other hand, international services are liberalised, but high-speed services are operated by consortia of public companies from the countries where they operate: Allegro, Alleo, Artesia (until 2011), Cisalpino (until 2009), Elipsos, Eurostar, Fyra, Lyria, TEE Rail Alliance, Thalys and Thello.

(*) According to the UIC, WESTbahn could be considered as a HSR operator as well since it operates at speeds up to 200 km/h, but let us assume that this belongs to a different category than Italo-NTV, which operates at 300 km/h on newly built HSLs.

Finally, the current status of the liberalisation of rail transport in the European Union members is summarized below (Exhibit 2).

Exhibit 2 | Liberalisation of Rail Transport in the European Union in 2017.

Source: El País and the European Parliament (translated from Spanish).

4

The Italian High-Speed Rail Network

4.1 Historical Perspective

4.1.1 The *Direttissima* Florence-Rome

The origins of high-speed rail in Italy go back to the 1960s with plans to build a new rail link between Rome and Florence. The original railway line consisted of a union of lines planned in the 19th century by different companies and with different purposes, with a total length of 315 kilometres of slow and tortuous tracks, while the real distance between both cities in a straight line is approximately 230 kilometres, whereas by road there are 277 kilometres. Taking into account that the Milan-Bologna-Florence-Rome axis had always been one of the busiest in the country, it seems reasonable that the improvement of one of the most difficult sections of the axis in terms of orography had been a concern for quite a long time.

After many studies, proposals and projects, only after the Second World War a project was finally established, consisting of a new line that, instead of replacing the existing line, it would be a coordinated system integrated with it with several links. Besides, the new line aimed to be straight and faster but above all shorter than the original line with a total length of 237,5 kilometres, and hence its name *Direttissima*, which means very straight in Italian (see Figure 1).

Works on the line started in 1970 and the first section of the line was opened in 1977. Nevertheless, the remaining sections to complete the line were opened in later stages, with the last 24 km section being opened in 1992. Many economic and political events had incredibly extended its completion duration to 22 years since the beginning of its works.

4.1.2 From the *Direttissima* to the Present

In the 1980s, plans for a HSR network were already being carried out. The system was initially conceived as separated from the conventional rail network and fully dedicated to passenger transport along the Milan-Naples axis and the Turin-Venice transverse axis. Its main aim, according to the *Piano Generale dei Trasporti* from 1986 (amended in 1991), was to significantly transfer amounts of traffic from road to rail, seeking for a better integration of transport in connections with large urban centers, ports and airport facilities as well as connections with other European rail networks.

The implementation of the aforementioned HSR project began in 1996, which was then conceived as a large-scale improvement of the railway network as a whole in order to allow a profitable interchange at the infrastructural level between new and existing lines with the aim to significantly increase the amount of traffic on the whole railway system. Therefore, the term *Alta velocità* (High-speed) was replaced by *Alta capacità* (High capacity) while keeping all mixed traffic (passenger and freight) HSR standards. However, only passenger services operate on the network at the present, except on the *Direttissima*.

After the completion of the *Direttissima*, the expansion of HSR in Italy went on in 2005 with the opening of the main section of the Rome-Naples line, but the urban penetration stretches in Rome and Naples were completed in later stages, with the line being fully-

Figure 1. A train travelling on the *Direttissima* with the older line in the foreground (1980s).
Source: nick86235.smugmug.com

completed in 2009. Besides, a direct link with the *Direttissima* in Rome was added, aimed at passing trains so that it would not be necessary to call at Rome Termini and reverse, with a 15-minutes travel time reduction for those trains.

Further completions include Turin-Novara section (opened in 2006), Padua-Venice and Milan-Treviglio sections (both opened in 2007), Naples-Salerno and Milan-Bologna sections (both opened in 2008) and Bologna-Florence and Milan-Novara sections (both opened in 2009). Therefore, the backbone of the Italian HSR network is fully operative since 2009. Finally, the Treviglio-Brescia stretch was opened in 2016. On the other hand, upgrades on the Bologna-Padua and Bologna-Verona lines had been carried out to allow a maximum operational speed of 200 km/h, including the addition of a second track in the entire stretches.

The current high-speed network matches very well with the original projects, with a “T” shape consisting of a vertical axis from Milan to Salerno and a northern transverse axis from Turin to Trieste. However, this transverse axis is not yet completed.

4.1.3 Future Lines

A number of projects to expand the network beyond the completion of the original plans are being carried out or are expected to be carried out in the future:

- Completion of the northern transverse axis from Turin to Trieste: works on the Brescia-Verona stretch are about to begin in April 2018, while the Verona-Padua section is already approved and awaiting for funding, and the remaining Venice-Trieste section is currently under planning. A further connection to Ljubljana is also considered in the long term.
- *Terzo Valico*: a new link 53 km link between Tortona and Genoa is under construction since 2011, aimed especially at freight traffic towards the Port of Genoa. This link is the part of the Milan-Genoa route that crosses the Ligurian Apennines and hence the orography in this stretch is very irregular (37 km will be constructed in tunnel), in contrast with the northern section towards Milan, which develops throughout the Po Valley, which is a fundamentally flat land.
- Lyon-Turin: a planned 270 km long, 220 km/h railway line will cross the Alps through a 57 km long new base tunnel, intended for freight and passenger traffic. Works in the tunnel are already in progress.

- Brenner Base Tunnel: this one will connect Verona and Munich through the Eastern Alps, intended for freight and passenger traffic. A 189 km high-speed approach from the southern portal of the tunnel to Verona is planned.
- Naples-Bari: an AV/AC project to upgrade the existing line has been carried out. Works began in 2016.
- Milan-Chiasso: a new route connecting the Italian HSR network to Switzerland is conceived as part of the New Railway Link through the Alps along the Gotthard axis. It should help decongest the existing Milan-Monza-Chiasso line. No official studies have been reported so far.

4.2 Technical Perspective

4.2.1 Overview of the Specifications of the Italian HSR Network

The *Direttissima* is often considered to be the first HSR line in Europe since its first stretch was opened in the 1970s, some years before the opening of the French LGV Sud-Est. Nevertheless, at the time when it was planned, the line was not conceived as part of a future Italian HSR network, but rather as a corridor for both conventional passenger trains and freight transport. Therefore, the *Direttissima* can be understood as a purpose to significantly increase capacity by providing two additional tracks in this stretch and fitted with advanced technologies.

Nonetheless, it is interesting to point out that its geometric standards were consistent with the long term duration of the new infrastructure: the minimum curve radius of 3.000 metres, the very gentle slopes adopted aimed at freight traffic and the distance between track centres (wider than in European standard conventional lines) makes the line actually suitable for operations at 250 km/h, provided that the rolling stock is homologated for this speed.

The previous geometric parameters of the line are very relevant in the sense that they reduce the “flexibility” of the line throughout the territory in the planning stage considerably so that, combined with the orographic characteristics of the territory crossed, resulted in a large number of viaducts (65) and tunnels (42) necessary to be constructed for the line, accounting for 50% of the total length of the route. This fact had indeed significant implications in the final construction cost of the line, as well as in the successive lines constructed.

The line was initially homologated for a maximum speed of 180 km/h. Anyway, no rolling stock was really capable of running faster at that time but, in 1985, the line was homologated for 200 km/h. Currently, HST services operate in the line at speeds up to 250 km/h. Operational speed increase up to 275 km/h in the stretch between Rovezzano and Chiusi (approximately 100 km long) is expected in the short term, since the project speed of this section is in fact 300 km/h, featuring a wider distance between track centres (4.3 m) and a greater minimum curve radius (3.900 m) than the rest of the line.

It is important to note that the *Direttissima* features numerous connections with the conventional line (namely 10) configured in such a way that allow trains using the HSL to stop at certain stations on the conventional line without long detours and obviously with no requirement to turn around. On the other hand, the line does not have any railway crossing or any kind of intersections. Moreover, all connections are effectuated by grade-separated junctions that avoid conflict with opposite direction train movements. These junctions are indeed extremely beneficial in busy railway lines with branch lines but need large physical structures and hence they are quite expensive. Finally, double crossovers each 16,2 km allow to use either track in either direction or operation on a single track in case of need, and the rails were laid using the UIC 60 kg/m welded rail type. The line is currently being modified to meet the new AV/AC line standards established by RFI for HSLs.

The *Direttissima* is a very convenient historical reference to introduce the AV/AC system introduced in 1996 due to its undeniable singularity from a technical point of view. The specifications for the new AV/AC system are presented below compared to those of the *Direttissima* (Table 5) and, additionally, other design parameters common for the whole network are presented as well (Table 6).

Table 5 | Specifications of the *Direttissima* and the AV/AC System.

Specifications	*Direttissima*	AV/AC
Maximum commercial speed (km/h)	250	250/300
Distance between track centres (m)	4,0	5,0
Minimum curve radius (m)	3.000	5.450
Maximum slope	0,80%	1,80%
Maximum load per axis (t)	25,0	25,0
Tunnel section (m2)	54	82
Maximum speed on crossovers (km/h)	160	160
Electrification	3 kV DC	25 kV 50 Hz AC
Security systems	SCMT	ERTMS/ECTS

Source: own analysis using data from different sources.

Table 6 | Other HSL Specifications.

Specifications	
Maximum cant (mm)	105
Minimum curve radius in vertical arrangements (km)	20
Platform width (m)	13,6
Average distance between electrical substations (km)	50
Average distance between sidings (km)	48
Loading gauge	UIC C

Source: own analysis using data from different sources.

Since then, all new Italian HSL have been built meeting these standards, which are very similar to those of other European, mixed traffic HSLs. The most relevant practical implications of the design for both freight and passenger traffic include the need to adopt large minimum curve radius, low cants and very gentle slopes as it was already done in the *Direttissima*. Aside, another very characteristic feature of Italian HSLs is the amount of interconnections of the new infrastructures with existing railway lines. Interconnections on the Turin-Milan-Naples-Salerno axis (858 km of HSLs, urban penetrations not included) account for a total length of 77 km. All HSLs feature double track, as usual in any HSR network.

Since the opening of Treviglio-Brescia in 2016, the Italian HSR network is approximately 950 kilometres long. Its HSLs are presented below (Table 7 and Exhibit 3).

Table 7 | Current HSR Lines in Operation in Italy.

Line	Length (km)	Opening	Travel time (h)	Maximum speed (km/h)	Voltage	Length in tunnel	Length in viaduct
DD Florence-Rome	238	1977/1992	1:18	250	3 kV DC	30%	19%
Rome-Naples	205	2005/2009	1:08	300	25 kV 50 Hz AC	19%	19%
Turin-Milan	125	2006/2009	0:44	300	25 kV 50 Hz AC	4%	16%
Padua-Venice	25	2007	0:14	240	3 kV DC	0%	14%
Milan-Brescia	67	2007/2016	0:36	300 [1]	25 kV 50 Hz AC	1%	6%
Naples-Salerno	29	2008	0:30	250	3 kV DC	52%	
Milan-Bologna	182	2008	0:53	300	25 kV 50 Hz AC	2%	21%
Bologna-Florence	78,5	2009	0:35	300	25 kV 50 Hz AC	92%	0%

Lengths above account for new infrastructure built (no urban penetrations). Interconnections are not included. All HSR lines listed feature double track. Minimum travel times between city centres.
[1] Limited to 180 km/h between Milan and Treviglio.
Source: own analysis using data from different sources.

Exhibit 3 | The Italian HSR Network.

Source: RFI.

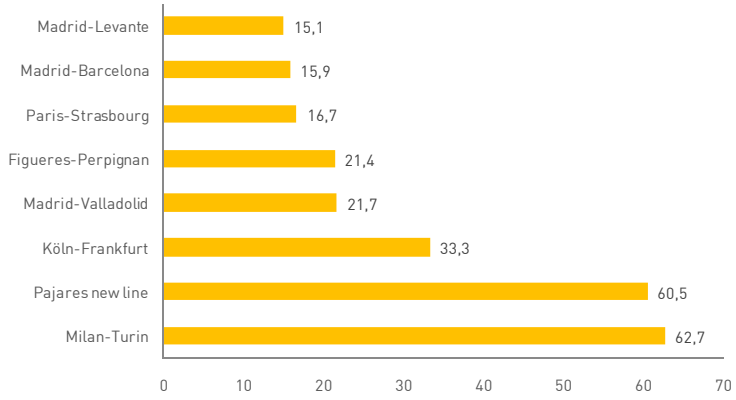
4.2.2 Network Geography

The Italian geographic and demographic characteristics are favourable for HSR since it allows serving a large population in a string of large cities. The north-south axis serves a number of cities separated by distances ranging from 150 to 250 kilometres (especially in the north), which are indeed optimal distances to make HSR competitive against other means of transport, namely air and road transport.

4.2.3 Explanation of the Particularly High Construction Costs of the Italian HSR Network

One of the things that characterize the Italian HSR network is its very high construction cost per kilometre compared to many other European HSR lines. Construction costs depend on a wide range of factors, such as the orography of the territory. In general, it can be assumed that they are found in the 10 to 30 M€ threshold. A comparison between the construction costs of some European HSLs is presented below (Exhibit 4).

Exhibit 4 | Construction Cost of some European HSLs.
M€/km



Source: own analysis using data from different sources.

Construction costs tend to increase significantly when the orography is more unfavourable as, for instance, it may cause the need to dig exceptionally long tunnels. However, the Milan-Turin HSL is clearly an anomaly in the examples listed above as it is constructed on a fully flat area. According to Mr. Antonio di Pietro, ex infrastructure minister, the average construction cost per kilometre of the Italian HSR lines is 44 M€ (Il Sole 24 Ore, 2007). The main reasons that explain this fact are the following:

- The mixed HSL parameters, as mentioned previously, limit the “flexibility” of the line throughout the territory severely, requiring the construction of large and expensive works such as tunnels and viaducts.
- The previous fact is aggravated by the irregular orography of many territories that some of the Italian HSR lines cross.

- The number of interconnections with conventional lines built stands for a large number of additional kilometres of infrastructure needed to be built in the addition to the HSL strictly.
- High urbanization of the territories crossed.
- On-ramps, off-ramps and underpasses often need to be rebuilt when existing highway corridors are used to build the new HSR.
- Archaeological monitoring of the territory and eventual interventions.
- Socio-environmental insertion of the new lines in the territory.
- Others: amounts for “coordination and organization” and compensations for local administrations.

4.3 Operational Perspective

4.3.1 HST Services

HST services on the Italian HSR network are operated by Trenitalia and Italo (since 2012), and both companies compete with each other in the market. Trenitalia HST services are differentiated into two categories: Frecciarossa and Frecciargento. The first category is the premier service, which operates at speeds up to 300 km/h, while the second category services are operated by *Pendolino* tilting trainsets at speeds up to 250 km/h.

The difference between both services, apart from the top speed, is mainly technological: Frecciarossa services are operated by non-tilting trainsets while Frecciargento services, by contrast, are operated by *Pendolino* trains with tilting systems, which allow these trains to raise the speed on conventional lines, specially on the tortuous ones. Therefore, only some stretches of Frecciargento services operate on HSLs, while in the remaining conventional line stretches they are able to run at higher speeds than ordinary trains.

A third category, named Frecciabianca, operates long distance services on routes that are generally out of the HSR network, namely many routes along the Adriatic and Tyrrhenian coasts, at speeds up to 200 km/h or 250 km/h depending on the rolling stock used. However, some Frecciabianca services operate on the *Direttissima* in addition to the HST services listed above, as well as some Intercity (maximum speed of 200 km/h) and regional services (maximum speed of 160 km/h). At the end of 2016, Frecciarossa trains supplied nearly 60% of Frecce brand services.

On the other hand, Italo operates a single brand of HST services named Italo (same as the company’s current name) which operates fully or partially on HSLs and hence they are comparable to both Trenitalia Frecciarossa and Frecciargento, with which Italo competes directly.

The current travel times between the central stations in the major Italian cities by HSR are presented below (Table 8).

Table 8 | Trenitalia and Italo Shortest Travel Times Between Major Stations.

	Bologna	Florence	Milan (Centrale)	Naples (Centrale)	Padua	Rome (Termini)	Salerno	Turin (Porta Susa)	Venice (Santa Lucia)	Verona
Bologna		0h 35min	1h 02min	3h 13min	0h 59min	1h 54min	3h 31min	1h 58min	1h 27min	0h 50min
Florence	0h 35min		1h 39min	2h 29min	1h 37min	1h 27min	3h 18min	2h 36min	2h 05min	1h 29min
Milan (Centrale)	1h02 min	1h 39min		4h 13min	1h 57min	2h 55min	4h 34min	0h 47min	2h 25min	1h 13min
Naples (Centrale)	3h 13min	2h 29min	4h 13min		4h 37min	1h 07min	0h 34min	5h 13min	5h 05min	4h 18min
Padua	0h 59min	1h 37min	1h 57min	4h 37min		2h 58min	5h 03min (*)	2h 55min	0h 26min	0h 42min
Rome (Termini)	1h 54min	1h 27min	2h 55min	1h 07min	2h 58min		1h 30min	3h 55min	3h 24min	2h 53min
Salerno	3h 31min	3h 18min	4h 34min	0h 34min	5h 03min (*)	1h 30min		5h 51min (*)	5h 44min (*)	5h 09min (*)
Turin (Porta Susa)	1h 58min	2h 36min	0h 47min	5h 13min	2h 55min	3h 55min	5h 51min (*)		3h 25min	2h 11min
Venice (Santa Lucia)	1h 27min	2h 05min	2h 25min	5h 05min	0h 26min	3h 24min	5h 44min (*)	3h 25min		1h 10min
Verona	0h 50min	1h 29min	1h 13min	4h 18min	0h 42min	2h 53min	5h 09min (*)	2h 11min	1h 10min	

(*) A transfer is required.
Source: own analysis using data from Trenitalia and Italo (updated in April 2018).

4.3.2 Insight into the Rolling Stock Used

In the beginnings of the *Direttissima*, passenger train services were hauled by E.444 class electric locomotives carrying Gran Confort passenger cars and, besides, the ETR 300 class EMU trainset operating the famous *Settebello* HST service that linked Milan Central and Rome Termini stations and belonging to the prestigious Trans Europe Express long distance train network. This service was withdrawn in 1984 and replaced by locomotive-hauled Gran Confort cars.

Later in 1988, the new ETR 450 class high-speed EMU trainsets entered in service on the Rome-Milan route at speeds up to 250 km/h, capable to link both cities in less than 4 hours. This EMU stands for a relevant milestone in the history of the Italian railways, as it was the first *Pendolino* to enter in a HST service in the world. Its successors currently operate Frecciargento and Frecciabianca services on the Italian HSR network (ETR 463, ETR 470, ETR 485 and ETR 600). *Pendolino* is a nowadays a family of Italian tilting trains used in Italy, Spain, Poland, Portugal, Slovenia, Finland, Russia, Czech Republic, the United Kingdom, Slovakia, Switzerland and China.

Nowadays, HST services are operated by modern, cutting-edge, self-propelled, fixed composition bi-directional trainsets with maximum speeds of up to 250 and 300 km/h (depending on the train series and on the HSL). For further information and specifications on both Italo's and Trenitalia's rolling stock refer to the Appendices 1 and 2.

4.3.3 New Stations and Urban Operations

For many years, no intermediate stations were constructed on the Italian high-speed rail network between major cities. However, the Reggio Emilia AV Mediopadana station was opened in 2013 on the Milan-Bologna HSL between Parma and Modena, thus becoming the first station of this kind. The station, designed by the Spanish architect Santiago Calatrava, serves central Po valley, including the cities of Reggio Emilia (140.000 inhabitants), Parma (175.000 inhabitants), Modena (180.000 inhabitants), Piacenza (100.000 inhabitants) and Fidenza (24.000 inhabitants). The station provides connection with urban and interurban buses, as well as a direct connection with regional trains covering the Reggio Emilia-Guastalla route.

Additionally, the Naples Afragola station was opened in 2017 on the HSL Rome-Naples near its end. Its purpose will be discussed in the following section. Both Reggio Emilia AV Mediopadana and Naples Afragola train station have the common scheme of tracks of intermediate HST stations, consisting of two central through tracks with no platforms for non-stopping trains and two lateral tracks with platforms for stopping trains. With this configuration, overtaking is possible if needed.

On the other hand, it is worth noting that as part of the HSR projects, some major urban operations have been carried out, such as the new Turin Porta Susa station (which replaced the old surface station), the 18 kilometre urban tunnel and enlargement of Bologna central with new underground platforms for HST services (allowing to speed them up in the urban area), or the new Rome Tiburtina hub station for high-speed trains.

4.3.4 Operation Constraints due to the Terminus Configuration of Some Hub Stations

Many of the busiest railway stations in Italy, such as Rome Termini, Milan Central, Turin Porta Nuova, Florence Santa Maria Novella and Naples Central (which are the main stations in each of those cities, where long-distance train services generally call), are terminus, which means that all main lines converge on these stations. This fact has brought some inconveniences for the operation of a HSR network throughout the country, since any train travelling through one of these cities and calling at one of these specific stations have to turn around necessarily. For instance, a Frecciarossa HSR service travelling from Salerno to Turin must reverse in Naples Central, Rome Termini, Florence SMN and Milan Central (up to four times).

These operations are intensively time-consuming, compared to commercial stops in through stations, not only due to the turn around by itself, but also because the approaches to some of these stations, such as Milan Central, are very slow and congested. For instance, it is estimated that a through train serving Rome saves up to 13 minutes if it uses the link between the *Direttissima* and the HSL Rome-Naples, stopping at Rome Tiburtina, instead of stopping both at Rome Termini and Tiburtina. This is quite relevant to take into account if we recall that HSR is intended precisely to reduce travel times, but then it turns out that HST services waste time in turnarounds and urban penetrations.

The Government and FS have tried to tackle these issues in two different ways:

1) HSR services route patterns may be slightly modified in such a way that terminator services at one specific city call at the central, terminal station, whilst services not terminating at that city call at an alternative, through train station. In this way, travel time for passengers travelling beyond this city is not penalized, assuming that the terminal station is already well served by terminator services.

2) Overall reconfiguration of rail infrastructure in one city with the construction of a new rail link through the city including a new, through station annexed to the existing terminal station or close to it. Nonetheless, it is obvious that the surroundings of existing central stations are already fully urbanized, so the only way

to implement this solution is to build the new link in underground, which entails a very high construction cost.

Let us have a brief review of the current situation and solutions adopted for each of these cities:

- **Rome**

The former Portonaccio station, located in the north-eastern part of Rome, was replaced by the brand new, renamed Rome Tiburtina train station, conceived as a hub for the Italian HSR services instead of Rome Termini. North-south through services were supposed to be all moved to Tiburtina to make their way faster by jumping the stretch to Termini, while Termini would continue to be served by all terminator services (in addition to Tiburtina), but it failed since today a very few trains skip Termini.

The conclusion, based on Trenitalia and Italo HSR operations, is that in Rome, in general, it is more efficient to spend the additional time required in urban penetration in order to call at Termini. This may be due to the fact that the centrality of Termini is difficult to be beaten by Tiburtina, which is away from the city centre and not so well connected with the rest of the city by rapid transit systems.

- **Milan**

The current configuration of railways in Milan require long-distance through trains to reverse in Milan Central. Any proposal to make Central into a through station would be an extremely expensive project, requiring extensive works. Therefore, this configuration will remain as it looks like nowadays in the very long term.

- **Turin**

Turin Porta station is not really an issue, as the majority of high-speed trains serving Turin are terminator services. Just a few international high-speed trains go through Turin, calling instead at the brand-new Turin Porta Susa station (which is a fairly well-located through station), where domestic high-speed services call as well in addition to Porta Nuova.

- **Florence**

A new underground station, called Florence Belfiore, is slowly being constructed one kilometre north of the existing Florence Santa Maria Novella station as part of a new HSR tunnel that will go through Florence. In this way, high-speed trains through Florence will be speeded up in the urban area and the existing tracks will be fully dedicated to regional and local traffic.

- **Naples**

A new station named Naples Afragola was built on the HSL Rome-Naples, about 10 km north of Naples Central. The main purposes of this station are two: firstly, to give a HSR service to the area north of Naples, because for many people leaving in the very large

Naples metropolitan area it is disadvantageous to head to Naples Central to travel northbound (Afragola is actually more central in the metropolitan area geographically). Secondly, similarly to the case of Rome, to cut travel time for trains covering the Rome-Reggio Calabria route, speeding up those services up to 25 minutes without dropping the stop at the Naples metropolitan area.

Currently, many of the Naples terminator services call at Naples Afragola, and through services seem to follow irregular patterns, with some of them calling only at Afragola, and others only at Central or at both stations. In fact, many of the Frecciargento and Frecciabianca through services that will use this station are yet to be deployed. For this reason, and taking into account that the station was opened recently in June 2017, conclusions based on the experience of the Naples Central-Naples Afragola coupled system cannot be drawn by now. However, its presented characteristics seem favourable for its success.

4.3.5 The Potential of Airport HSR Links

Direct connection between HSR services and airports are a very recent concept of transport intermodality, which had its first example in 1994 with the opening of the *Aéroport Charles de Gaulle 2 TGV* train station directly beneath terminal 2 of Paris Charles de Gaulle Airport on the *Interconnexion Est* HSL, which surrounds the Paris metropolitan area on the east side. Other major European airports were later equipped with HST stations as well, such as Frankfurt International Airport or Schiphol Airport, but also did minor airports such as Lyon Saint Exupéry.

The main purpose of these connections is to provide fast and efficient connections to travellers taking flights at an airport at a considerable distance (considering that HSR is not suitable for short distances), by taking advantage of a current HSR network. Therefore, it is clear that the potential of this kind of connections is indeed very interesting from many points of view as, if they are well planned, it is possible to transfer airport inbound flows to railways and hence achieve a higher use of the HSR network. In other words, HST services may be able to assume the role of many domestic air links to feed international flights, freeing slots for longer range flights at busy and congested airports.

Based on the experience of proven success of these links at the Charles de Gaulle Airport, Frankfurt Airport and Schiphol Airport among others, we can conclude that the ideal configuration is that, as in the previous examples, the airport HST station is constructed directly on the HSL. Nevertheless, the feasibility of these links obviously depends on the geographical layout of the infrastructures concerned. In fact, in many cases, airports do not happen to be conveniently located in order to be connected to HSR networks and, consequently, it is not possible to implement this configuration.

In these cases, alternatively, the option to route HST services through a dedicated branch line (which in many cases already exists for conventional railway) can be considered. Nonetheless, this solution is often less efficient for HST services: let us explain why.

HST services are operated by advanced, expensive specialized rolling stock capable to run at 250 km/h or faster. Because of the high purchasing and maintenance costs, efficiency in

operations matters and HST operators seek to reach high annual mileages at full payload and, therefore, operators must carefully assess if it is worth to schedule regular HST services to run on conventional lines at lower speeds.

Moreover, operation on conventional lines is less reliable than HSL, as rail traffic is more heterogeneous and generally more prone to incidents (older, unfenced infrastructure with less maintenance, railway crossings…), hence it has a non negligible impact on service robustness.

In the specific case of the airport rail link, operation planners have to consider if it is worth allocating the amount of additional resources required in order to extend existing HST services from one of its ends to a certain airport through a conventional line, taking into account that the extension may be overlapped with local or regional trains to the airport running roughly at the same speed and, of course, operated by much more adequate trains to cover such a short link. This consideration can explain partly why, for instance, the Adolfo Suárez Madrid-Barajas Airport probably will not have direct HSR connections in the near future.

From this reflection we can get a very interesting, generalist conclusion for HST services operation, which is that there is a trade-off between operating partially on HSR lines so as to serve certain destinations away from the physical HSL and confining services to full-HSR line routes (and hence achieving higher annual mileages). Furthermore, reliability issues must also be taken into account since the conventional network is typically more prone to delays than the HSR network.

Airport HSR connections may be a matter of interest for the HST operators, so for the purpose of analyzing its possibilities in Italy, the case of each one of the busiest airports in the country (Table 9) are discussed below, based on infrastructure available at the present. Those airports not located near the actual HSR network are excluded from the analysis.

Table 9 | List of the Busiest Airports in Italy.

Rank	Airport	City served	Passengers in 2017
1	**Rome Leonardo da Vinci-Fiumicino**	Rome	40.971.881
2	**Milan Malpensa**	Milan	22.169.167
3	**Bergamo Orio al Serio**	Bergamo / Milan	12.336.137
4	**Venice Marco Polo**	Venice	10.371.380
5	**Milan Linate**	Milan	9.548.363
6	**Catania-Fontanarossa**	Catania	9.120.913
7	**Naples**	Naples	8.577.507
8	**Bologna Guglielmo Marconi**	Bologna	8.198.156
9	**Rome Ciampino**	Rome	5.885.812
10	**Palermo**	Palermo	5.775.274
…	…	…	…
24	**Trieste Friuli Venezia Giulia**	Trieste	780.776

Source: ENAC.

- **Rome Fiumicino Airport**

Fiumicino Airport has a rail link since 1990 consisting of a dedicated branch line (Figure 2) with direct train services to Rome Termini (Leonardo Express), regional train services to Fara Sabina, Poggio Mirteto and Orte (FL1), and finally two daily Frecciargento services covering the route from Rome to Florence, Bologna and Venice and vice versa. These long distance train services were launched in 2014 and are in effect very limited and hence conclusions on this experience cannot be stated so far.

Due to too short platforms, it is not possible to operate Frecciarossa services, which are often powered by ETR 500 class trainsets too long to call at Fiumicino train station, whereas Frecciargento services are operated by shorter trainsets that fit in Fiumicino platforms. Nonetheless, there are plans to build a dedicated HSL to the airport in the long term.

- **Milan Malpensa Airport**

Malpensa Airport has a rail link since 1999 consisting of a dedicated branch line (Figure 3) with regional train services to Milan Central, Milan Cadorna (Malpensa Express services) and Varese-Mendrisio (Switzerland)-Como (TILO S40, as of 10th June 2018).

However, operation of HST services using this link would not be simple. Firstly, the current station platform length is about 250 m, so it can only handle 200 m long configured HST and hence standard double compositions of up to 400 metres long are not feasible. Secondly, Malpensa is away from any Italian domestic route, so any HST service must end in Malpensa. The only long-distance service which could serve Malpensa without a long detour and without terminating there would be the Milan-Geneva and Milan-Basel (via Lötschberg-Simplon) Eurocity trains, for which a link from the current station towards the Simplon railway (Milan-Gallarate-Domodossola-Brig) both northbound and southbound is planned.

The few HST services that served Malpensa in the past were short lived and with just a couple of services per day. These were Malpensa-Milan-Rome trains around 2011 and Malpensa-Novara-Turin during the weeks of the 2006 Winter Olympics. These services were operated by 8-car shortened ETR 500 class trainsets. At the present, all ETR 500 class trains carry 11 cars.

Figure 2. Partial view of Fiumicino Airport. The viaduct of the rail link can be clearly seen on the right side. Source: stradeeautostrade.it.

Figure 3. Satellite view of the Malpensa Airport rail link. Source: own elaboration with Google Earth.

- **Bergamo Orio al Serio Airport**

There is no rail link nor any plans to build one. Besides, Orio al Serio is a low-cost airport, so it is not actually the target of airport HSR connections.

- **Venice Marco Polo Airport**

There is no rail link, but the Venice-Trieste HSL project foresees to include a station at Venice Airport.

- **Milan Linate Airport**

There is no rail link nor any plans to build one.

- **Naples Airport**

There is no rail link nor any plans to build one.

- **Bologna Guglielmo Marconi Airport**

There is no rail link nor any plans to build one.

- **Rome Ciampino Airport**

There is no rail link nor any plans to build one. Besides, Ciampino is a low-cost airport, so it is not actually the target of airport HSR connections.

- **Trieste-Friuli Venezia Giulia Airport**

Despite being a rather small airport, it is interesting to include it in the analysis since the Venice-Trieste rail line runs on the side of the airport very close to its terminal and, in fact, a new train station was opened on the line in 20th March 2018 with the purpose of serving it. A 425 metres long footbridge equipped with elevators, escalators and moving walkways connects the station with the air terminal.

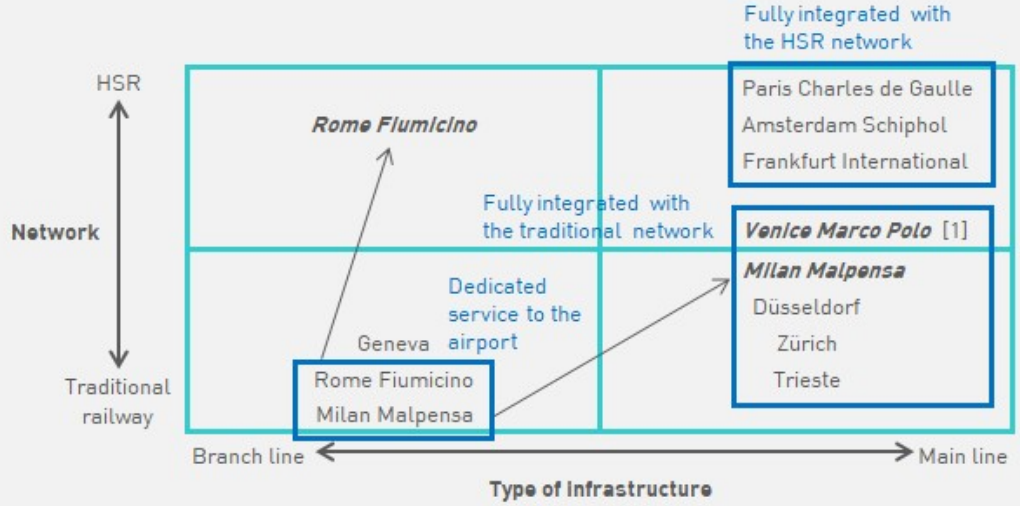
The station is served by about 70 daily trains, from which the majority are regional trains covering the Venice-Portogruaro-Trieste and Trieste-Cervignano-Udine-Tarvisio routes. However, a few long distance trains call at the station, including 4 daily Frecciarossa services covering the Milan-Venice Mestre-Trieste route plus 2 daily Frecciargento services and 4 Intercity services both covering the Rome-Venice Mestre-Trieste route.

- **Conclusions**

Since Rome Fiumicino Airport, Milan Malpensa Airport and Venice Airport are the main international gateways to Italy, it is of the greatest interest to HSR operators to assess the opportunity to take advantage of calling at these airports in order to get more potential users. Nevertheless, several technical constraints limit the possibilities to operate HSR services on the existing airport rail links at the present, but it could be feasible in the long term. Feeding traffic is currently mostly captured by Alitalia through Fiumicino Airport.

Configurations of rail links to the aforementioned airports and their future scenarios in comparison with rail links to other European airports with long-distance train service are summarized below (Exhibit 5).

Exhibit 5 | Configurations of Italian Airport Rail Links Compared with Those of Other European Airports with Long-Distance Train Service.



Future scenarios are highlighted in ***italics***.
[1] In the particular case of Venice airport it is not yet defined whether the new link will be intended for high-speed or conventional railway.
Source: own analysis.

5

Introduction to Italo

5.1 Chronology

2006

December 11th Establishment of *Nuovo Trasporto Viaggiatori S.p.A.* by a consortium of Italian businessmen including Mr. Luca Cordero di Montezemolo, Mr. Diego Della Valle, Mr. Gianni Punzo and Mr. Giuseppe Sciarrone with the aim to compete in the HSR passenger transport, as open access operations on railway lines by companies other than those that own the rail infrastructure is going to be allowed in the European Union. An initial investment circa €1 billion will be carried out. In its current previsions, the company expects to reach a 20% market share in the Italian HSR transport by 2015, carrying 10 million passengers per year. This market volume will be reached by operating 54 daily services along the axis Turin, Milan, Bologna, Florence, Rome, Naples, Salerno and Bari, a total production of 13.5 million km per year. The debut is scheduled for 2010. The company also shows interest to participate in tenders for other rail transport segments in later stages as well, such as freight and regional passenger services.

2007

February 6th The Ministry of Transport, through the General Direction of Rail Transport, releases to NTV the railway license for the operation of national rail passenger services.

July 28th The General Direction of Rail Transport releases in favor of NTV the authorizing title for access to the national rail infrastructure.

November 26th NTV signs with the French manufacturer Alstom the contract for the supply and maintenance of 25 AGV 575 trains.

2008

January 17th NTV signs with RFI the ten-year duration Framework Agreement for which the infrastructure manager undertakes to make available to NTV the required infrastructure capacity.

July 15th NTV holds its public presentation with the presence of its founding partners as well as the partners that joined the company later.

October 10th SNCF enters into the capital of the company with a 20% of the shares. Additionally, Mals entered into the capital with a 5% of the shares.

November 18th “Italo” is selected as NTV’s service brand name through an internet survey.

2009

April 20th The first training course for train engineers starts.

June 19th Works on the new dedicated plant with a total area of 150.000 m^2 in Nola (Naples province) for the maintenance of NTV fleet of trains begin.

July 22th NTV headquarters is opened in Policlinico avenue 149/b in Rome.

2010

February 9th Start of ran tests with the AGV train prototype named *Pegase*.

December The first AGV train ordered by NTV arrives in Italy. Tests go on in 2011 with AGV series trains in order to obtain the homologation of the rolling stock.

2011

January 17th The hospitality school for the training of on-board and ground staff is opened.

March RFI is about to approve an update of the PIR (Network Information Prospectus), which had previously established that the Security Certificate, needed for the homologation of the trains (essential to operate services), could be submitted at the time of signing the contract to use the infrastructure, by which NTV has scheduled their business plan and their investments. However, the updated PIR would establish that the Security Certificate had to be delivered within 4 months after the infrastructure capacity request, in a way such that NTV would not be able to obtain it by August 2012, hence putting off the beginning of commercial services 12 months until 2013. This would have meant a serious handicap for NTV.

May The update of the PIR is partially approved with no penalties to NTV.

June The Italian Government passes a surcharge on private operators using the HSR network, earmarked to reduce access charges on HSR tracks for public service contracted trains. This was indeed aimed at NTV.

September 1st Works on the maintenance plant in Nola are completed.

September 16th ANSF homologates the trains for its operation.

October 19th NTV receives the Security Certificate. However, FS CEO Mr. Mauro Moretti opens a controversy by stating that the NTV prototype was unstable while running at speeds higher than 250 km/h, a statement that was rebutted by NTV board and Alstom itself.

December 13th Inauguration of the maintenance plant and public presentation of the Italo train.

2012

January After many interpellations, the ANSF certified in January 2012 that NTV was ready to launch its commercial services by the end of the following March.

March 6th ANSF releases the authorization to launch Italo services.

March 20th ANSF releases the Security Certificate to NTV.

April 21st The maiden voyage of Italo is hold on the Milan-Bologna and Rome-Naples lines.

April 28th Italo makes its commercial debut on the Milan-Naples route, after many delays that have postponed this milestone for about two years. According to Mr. Marco Ponti, professor of transport economics at the Politecnico di Milano, consumers already benefited from the beginning of competition, as Trenitalia had lowered its ticket prices and improved the service. Nonetheless, Ponti highlighted that the circumstances were not favorable for NTV due to its relatively small size compared to Trenitalia, the economic crisis and the risk to go bankrupt, while Trenitalia (that at the same time owns the railway, the stations and the entire infrastructure) cannot fail as it is a state company. Following the launch of the initial services, NTV network would quickly expand in order to complete the planned network.

October Italo services reach Venice.

October 24th Mr. Antonello Perricone becomes the new NTV CEO, replacing Mr. Montezemolo, who remains on the company's board.

August Some services are extended to Salerno and non-stop services Rome-Milan are launched.

December Italo services reach Turin.

2013

March The fleet of the 25 AGV trains is now completely delivered to NTV.

June 11th The Italian antitrust authority announces that it will launch an investigation into FS and its subsidiaries following allegations by NTV that the national railway had engaged in anticompetitive practices against the newcomer. NTV alleged that they had been the victim of a deliberate strategy of exclusion by FS, including limiting access to infrastructure and selling tickets at below cost price.

December 15th A new service is launched between Milan, Bologna, Rimini and Ancona, one of which also serves Turin.

2014

March 5th NTV launches a cost cutting programme focused on staff and company directors due to the effects of Italy's continuing poor economic performance and strong competition from incumbent high-speed operator Trenitalia. On the other hand, NTV has reached an agreement with Hahn Air, which will give it access to more than 91,000 travel agencies worldwide. This will allow travel agents to offer passengers combined flights and rail travel.

March 12th The Italian antitrust authority declares that it has found no evidence of abuse of the FS dominant position following NTV's complaints in June 2013.

April 7th RFI agrees to allow NTV to start running Rome services from Rome Termini station.

June 15th NTV transfers some services to Rome Termini station, while the rest of them remain at Rome Ostiense station. Italo's presence at Rome Tiburtina station remains intact.

September 24th NTV votes to restructure its debts after a €77 million loss in its first full year of operation, with shareholders expected to contribute capital. The company has also decided to withdraw Italo services to Ancona from the start of the 2015 timetable on December 15th.

October 24th The Ministry for Economic Development announces that the proposed initiative regarding the "Creation of a new fleet of high-speed trains operating under the Italo - NTV brand" was eligible for inclusion in the White Certificates programme as a "Major Project".

October 30th NTV presents to trade unions a major restructuring plan for the company which included the intention to lay-off up to 248 staff (a quarter of its workforce).

November 5th The Transport Regulation Authority's president Mr. Andrea Camanzi announces a 37% reduction in HSL usage fees (for both Italo and Trenitalia) starting in 2015.

December 15th NTV axes Italo services to Ancona after one year of its launch.

2015

February 26th Mr. Flavio Cattaneo takes on the role of the company's new CEO. Mr. Antonello Perricone remains with NTV as the company's president. Cattaneo makes it a priority to tackle the company's €675 million debt through a new 2015-2020 Business Plan.

March The operator hints at several reforms to achieve its goal of breaking even by 2020, including a capital increase of €70-100 million and the purchase of six to 10 new high-speed trains. Increasing NTV's service offerings is part of the strategy to boost revenues and its balance sheet. On the other hand, all employees are subject to a contract of

solidarity, which foresees a 9% cut in wages, but to avoid job losses NTV is proposing a 20% cut and is currently negotiating the terms with unions.

April 13th Workers at NTV go on strike for the first time. Negotiations with unions are going on.

April 17th NTV reaches an agreement with Italy's rail unions, which aims to avert redundancy for 250 staff, around a quarter of the company's workforce.

October 28th NTV board approves the award of a contract for Alstom Transport for the supply and maintenance of new 8 trainsets, branded EVO. Their maximum operating speed will be 250 km/h, compared to the 300 km/h of AGV trainsets.

December All Italo services calling at Milan Garibaldi are transferred to Milan Central, while stops at Milan Rogoredo are not altered. On the other hand, NTV withdraws all remaining services from Rome Ostiense and transfers them to Rome Termini. Besides, trains in Turin now call at Porta Nuova station (in addition to Porta Susa) and new services from Naples to Verona via Bologna are added to the network. Finally, NTV launches Italobus services from Reggio Emilia train station.

2016

March 1st Two daily Verona roundrip services are extended to Brescia. On the other hand, NTV releases its financial results of the previous year 2015, reporting a positive EBITDA for the very first time.

May The production of the new EVO trains is launched at the Alstom plant in Savigliano. On the other hand, summer seasonal services from Milan to Rimini are resumed.

September 7th NTV orders 4 additional EVO trains, bringing the number of trains in the new fleet to 12.

December The very first carriage of the new EVO trains is unveiled at the Alstom plant in Savigliano (Cuneo province) where it will be produced in series. Besides, two important agreements are signed with RFI: the first related to amendment and supplementation of the Framework Agreement until 2027 and makes more railway infrastructure available to NTV in line with the new requirements arising from expansion of the fleet; the second regards provision of a third maintenance facility near Venice Santa Lucia station (in addition to the ones already operating in Nola and Milan), aimed at a greater operating efficiency.

2017

July EVO homologation tests are completed in line with schedules.

October 3rd The first EVO train is displayed during the Expo Ferroviaria 2017.

November 9th NTV orders 5 additional EVO trains. A fleet of a total of 17 EVO trains is now ordered. NTV will have a fleet of 42 trains as of 2019.

December The first four NTV EVO trains begin commercial service on the Rome-Venice route. Along with that, a new stop at Rovigo, on the Bologna-Venice line is added

2018

January NTV S.p.A. is renamed Italo S.p.A., the name assigned to its train services. A few days later, the company submits an application for the admission to the Consob in order to be listed on the Milan Stock Exchange.

February 7th Italo is instead sold to the US-based Global Infrastructure Partners for €1.98 billion.

April 5th The European Commission approves the acquisition of Italo by GIP.

May 1st Italo launches new HST services on the Turin-Milan-Verona-Venice axis.

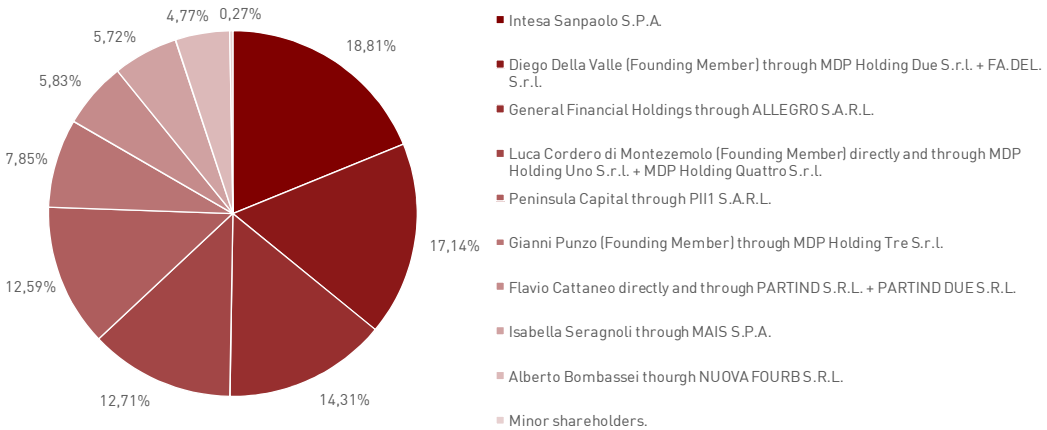
Last update: June 2018.

5.2 Shareholders

Nuovo Trasporto Viaggiatori S.p.A was founded in December 2006 by the entrepreuners Luca di Montezemolo, Diego Della Valle, Gianni Punzo and Giuseppe Sciarrone. During the following years, many other shareholders have joined the company, including the French National Railways SNCF with a 20% of the shares.

NTV carried out a recapitalization at the end of 2015 (increase by €100 million) that modified the shares of the company's stock: SNCF reduced its participation from 20% to only 1.4%, while Cattaneo has increased it. MDP Holding remains the largest shareholder with 36.8%, followed by Intesa SanPaolo S.p.A. The current share capital accounts for €60.017.725,00 (updated in May 2018), and the shareholding structure is presented below (Exhibit 6).

Exhibit 6 | Italo Shareholding Structure in March 2018.

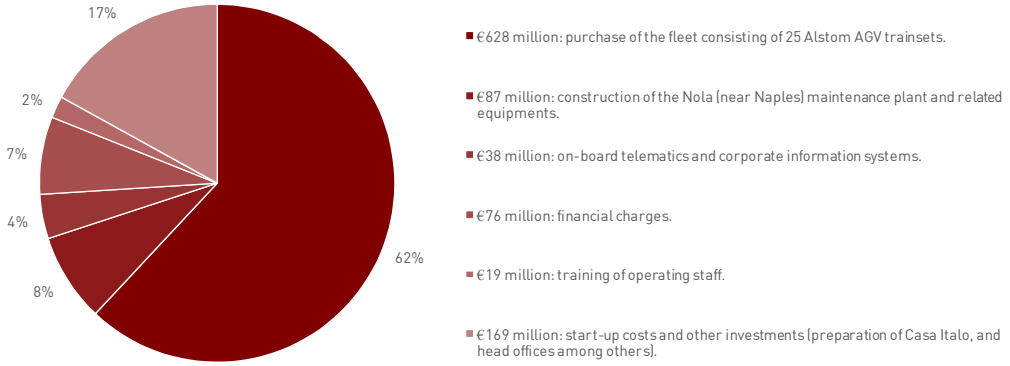


Source: Italo S.p.A.

5.3 The Up-Front Investment

The total, fully-private up-front investment (period 2008-2012) of €1.016 million is weighted as presented below (Exhibit 7).

Exhibit 7 | Italo Up-Front Investment (2008-2012).



Source: Italo S.p.A.

5.4 Network

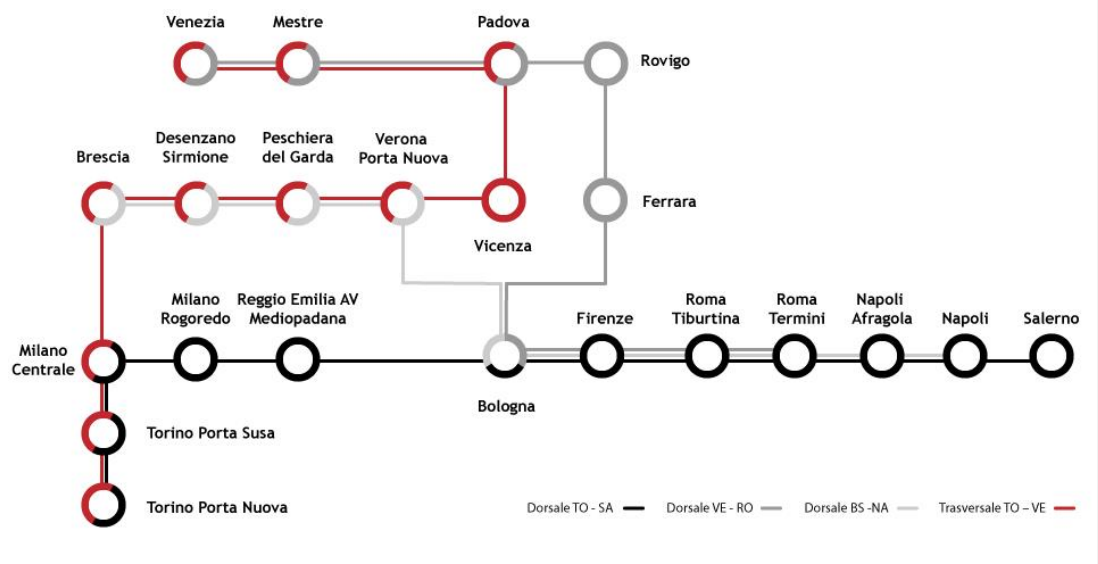
Italo operates the following routes (updated May 2018), which are drawn below (Exhibit 8):

- Turin-Milan-Reggio Emilia-Bologna-Florence-Rome-Naples-Salerno (up to 25 daily departures in each direction, up to 9 of them direct between Rome and Milan)
- Venice-Padua-Rovigo-Ferrara-Bologna-Florence-Rome-Naples-Salerno (up to 8 daily departures in each direction)
- Brescia-Verona-Bologna-Florence-Rome-Naples (3 daily departures in each direction)
- Turin-Milan-Brescia-Desenzano Sirmione-Peschiera del Garda-Verona-Vicenza-Padua-Venice (5 daily departures in each direction)

Notes: Number of daily trips according to the official current Italo timetables (from April 1st 2018 to June 9th 2018). It should be noted that not all train services cover the entire routes, but the Rome-Milan and Rome-Venice stretches are usually covered by all train services operating in the north-south axis.

By summer 2018, some services are planned to be extended from Verona to Bolzano, calling at Rovereto and Trento. On the other hand, Italo plans to introduce services to Genoa, but no official announcements have been so far.

Exhibit 8 | Italo HSR Network.



Source: Italo S.p.A. (updated in May 2018).

The network is completed by Italobus, consisting of a number of interurban bus routes fully integrated to Italo network linking some of Italo train stops with many other destinations not served directly by Italo train services (updated in May 2018):

- Milano Rogoredo-Capriate-Orio al Serio-Bergamo
- Verona-Rovereto-Trento-Canazei (the last stop is winter seasonal)
- Reggio Emilia-Parma-Cremona
- Reggio Emilia-Modena-Mantova
- Salerno-Picerno-Potenza-Ferrandina-Matera
- Salerno-Sala Consilina-Lauria-Frascineto-Cosenza
- Venice Mestre-Treviso-Cortina d'Ampezzo (winter seasonal)
- Torino-Aosta-Courmayeur (winter seasonal)
- Naples Afragola-Caserta-Benevento (announced in May 2018)

Services are timed to meet with Italo train services and hence to make connections convenient for users.

Italo train services connect 17 Italian cities and 22 stations (updated in May 2018), intercepting 71% of Italy's population (Italo S.p.A., 2018). Cities and stations served are listed below (Table 10).

Direct trains between Rome and Milan call at Rome Termini, Rome Tiburtina, Milan Rogoredo and Milan Central, although a few of them skip Rome Tiburtina. Besides, some trains travelling on the Milan-Turin stretch call at Milan Rho Fiera as well on selected dates when special events are being held at the Milan fair.

Table 10 | List of Train Stations Served by Italo.

City	Train stations
Bologna	Centrale
Brescia	-
Desenzano Sirmione	-
Ferrara	Termini
Florence	S. M. Novella
Milan	Centrale
	Rho Fiera [1]
	Rogoredo
Naples	Afragola
	Centrale
Padova	Centrale
Peschiera del Garda	-
Reggio Emilia	Mediopadana
Rome	Termini
	Tiburtina
Rovigo	-
Salerno	Centrale
Turin	Porta Susa
	Porta Nuova
Venice	Santa Lucia
	Mestre
Verona	Porta Nuova
Vicenza	-

[1] Trains call at Milan Rho Fiera on selected dates.
Source: own analysis (updated in May 2018).

When Italo services were launched, trains called at Rome Tiburtina and Rome Ostiense in the Italian capital. Rome Tiburtina station, located in the northeastern part of the city, underwent an important redevelopment to become a high-speed rail hub. With its works completed in 2011, it became Italo main terminal in the city. On the other hand, Rome Ostiense station, located in the southwestern part of the city, was used by Italo Rome terminator services as a secondary stop and for overnight stay of trains and cleaning.

In fact, Termini station is more centric and much better located and connected with public transport than Tiburtina station is, while its competitor Trenitalia has always operated high-speed trains from Termini. Nevertheless, this situation came to an end and NTV has been able to operate from Termini since June 2014. After moving all operations to Termini station, Ostiense station was dropped by NTV for passenger service but kept for train maintenance tasks.

Italo's presence at Rome Ostiense was the subject of severe controversies between NTV and RFI as well. In June 2012, NTV filed an anti-competitive complaint against RFI after they put a fence between Casa Italo (a mix of customer services and waiting area) and its platforms, causing inconveniences to Italo users. RFI alleged this was due to safety reasons.

With regards to Milan, Italo trains initially called at Milan Rogoredo and Milan Garibaldi. Milan Rogoredo station is located in the southeastern city limits and provides an easy access from all the Milanese hinterland. On the other hand, Milan Garibaldi was the main terminal in the city. In December 2015, all services were transferred to the neighbor Milan

Central station. In this case, the move did not stand for a significant improvement as it happened in Rome as Garibaldi station is already located in the central area of Milan and it is very well connected with the public transport network. As a matter of fact, Milan Central station is not served by the city's suburban rail network.
Finally, it is worth noting that Italo operated regular services to the Adriatic coast from December 2013 to December 2014, covering the route Milan-Bologna-Rimini-Ancona with 3 round trips per day, one of which also served Turin.

NTV operations at Rimini were subject of disputes between NTV and RFI as works of adjustment at Rimini station consisting in a platform rise were needed in order to operate AGV trains but were delayed by RFI several months. Moreover, it happened that Trenitalia decided to launch the same route after NTV announcement and managed to launch it a couple of months earlier than them since their trains met former standards appropriate to operate at Rimini station.

5.5 Rolling Stock

NTV chose to purchase Alstom's new generation high-speed train AGV (known as ETR 575 in NTV classification) for their forthcoming rail operations. In November 2007, NTV signed with Alstom the contract for the supply and maintenance of 25 AGV 575 trains, with an option for a further 10 trains. NTV was the first rail operator to acquire Alstom AGV trains and to date the only operator. Seventeen units were assembled at La Rochelle (France) and the eight remaining units were produced in Savigliano (Italy), at the former Fiat Ferroviaria plant.

It is interesting to highlight some technical differences between NTV AGV and Trenitalia's ETR 500, its closest competitor. Some technical features of trains ETR 575, ETR 500 and ETR 400 are displayed below (Table 11). These trains account for all existing high-end high-speed passenger services in Italy, equivalent to Spain's AVE.

The ETR 500 series lower power/weight ratio results in a lower acceleration in comparison to distributed traction trains. These superior performances of NTV AGV probably motivated Trenitalia to put forward an order for 50 trainsets class Frecciarossa 1000 (also known as ETR 400 in Trenitalia classification). Those trains indeed present some similarities to NTV AGV.

Apart from that, the length of ETR 575 series is suitable to allow double compositions, as the platform length for HSR is standardized at 400 metres in Europe. Therefore, NTV may be able to increase capacity on certain trains if the demand requires so. However, no double traction services have been reported so far, allegedly due to the fact that the company does not really have spare rolling stock at present since the entire fleet is intensively destined to the regular service.

Table 11 | Technical Features of Trains ETR 575, ETR 500 and ETR 400.

Class	ETR 575	ETR 500	ETR 400
Manufacturer	Alstom	Trevi [1]	Hitachi Rail Italy [2], Bombardier Transportation
Axle formula	EMU-11	EMU-13	EMU-8
Entered in service	2012-2013	2000-2005	2015
Operator	Italo-NTV	Trenitalia	Trenitalia
Commercial service	Italo	Frecciarossa	Frecciarossa
Traction [3]	Distributed (10/24)	Concentrated (8/52)	Distributed (16/32)
Power output (kW)	7.600	8.800	9.800
Weight (unloaded) (t)	375	576	454
Weight (loaded) (t)	423	640	500
Power/weight ratio (kW/t)	18,0	13,8	19,6
Maximum speed (km/h)	300	300	360 [4]
Length (m)	201,2	327,6	202,0
Capacity	450	574	457
Cost (M€)	26,0		30,8
Seat cost (€/seat)	57.777,78		67.396,06

[1] Trevi: consortium formed by Ansaldo, Breda, Fiat Ferroviaria, ABB Tecnomasio and Firema Trasporti.
[2] Hitachi Rail Italy was created in 2015 by taking over a company branch of AnsaldoBreda, which was responsible for ETR 400 series production.
[3] Numbers in parenthesis indicate the number of powered axles with respect to the total number of axles. In trainsets with concentrated propulsion, the two power cars always account for 8 powered axles.
[4] 360 km/h is the design commercial speed, but current operational speed is limited to 300 km/h.
Source: own analysis with data from UIC, Railfaneurope, Wikipedia and others.

On the other hand, in October 2015, 8 Alstom's Avelia family trains were ordered (known as ETR 675 in NTV classification and branded as EVO), though the order was later expanded up to 17 units. The ETR 675 series is in fact an evolution of Alstom's Pendolino family, a name that remained as a brand, as those trains are not actually fitted with tilting technology since NTV considered it would not be necessary for the planned duties. These trains have a higher seating density than AGV trains but a lower maximum speed of 250 km/h.

The trains are being assembled entirely in Italy and will be used to expand the Italo network in mixed routes of HSLs and conventional lines, while ETR 575 series will be used exclusively on high-speed lines. EVO trains have a distributed traction as well. The first four units entered in service in December 2017. In late May 2018, 11 units were already delivered to Italo.

Finally, the company owns two D 200 diesel locomotives from Vossloh (type G2000) for shunting and rescue duties.

5.6 On-Board Service

Italo AGV trains feature four levels of service (denominated ambiences by Italo), denominated Smart, Comfort, Prima and Club Executive. The main differences between these classes focus on the seating configuration (2+2 in Smart, 2+1 in the rest of classes), the legroom and the service offered, both on ground and on-board. These levels of service are compared with those of full-service carrier airlines and Frecciarossa trains below (Table 12).

Comfort was added in 2016 (in AGV cars 4 and 5) as an intermediate class between Smart and Prima, replacing the former Smart XL (in practice it is its evolution), offering Prima seats without its additional services (such as Fast Track, welcome service, newspapers and magazines) at a lower cost. Therefore, the capacity was increased from 450 to 462 seats. Additionally, each AGV train has a dedicated Smart cinema car (car 11), in which high-definition movies are projected during trips. Club Executive is equipped with individual video screens and two meeting rooms. All seats feature individual electrical sockets and free Wi-Fi is available for all passengers.

Italo AGV trains are designed so that the number of cars offering Prima and Comfort can be adapted to meet demand. On the other hand, EVO trains are fitted with Smart, Prima and Club Executive levels of service. On-board bar-restaurant is not available, but trains are fitted with two vending machines and on-board catering is provided in Prima and Club Executive.

Table 12 | Levels of Service Equivalences.

Airline standard	Italo	Frecciarossa
Economy	Smart	Standard
Premium Economy	Comfort [1]	Premium
Business	Prima	Business
First	Club Executive	Executive

[1] Only in AGV trains.
Source: own analysis.

For further detailed information and specifications on Italo's and Frecce's network, services list, levels of service, fares and rolling stock, refer to the Appendices 1 and 2.

6

Italo's Performance Analysis: an Approach to Strategy and Costs Management

6.1 Strategic Management

6.1.1 Overview

The aim of this section is to expose how the board of NTV configured the product Italo from a business model point of view in order to achieve the targeted market share. The key to success is, indeed, to make Italo competitive, which includes the setting up of an attractive product, the minimization of CASK (lower than Trenitalia's HSR services, presumably feasible as Trenitalia was founded from the former public state-owned Ferrovie dello Stato holding, from which it inherited certain rigidities) and the maximization of revenue.

In this sense, the company's strategy must focus on a number of items, including the rolling stock (fleet size, capacity, technical performances, maintenance…), workforce (work shifts, wages, working conditions, tasks, on-board crew, relationship with unions…), product (target audience, levels of service, on-board services, fares, frequency), network (routes operated, stations served, integration with other transport services), marketing and other investments and determinant factors (the ticket distribution system, outsourcing…).

Thus, the ambition and the innovative and entrepreneurial spirit of NTV was a key condition for the success of Italo since the company made a very large and risky investment of €1 billion, including the purchase of 25 trains, a strategy that enabled them to benefit from economies of density and economies of scale.

Italo's cost structure is inspired by the low cost airline model, since fixed costs are minimized and the ticket distribution system adopted is overwhelmingly digitalized (Desmaris, 2016). Besides, pricing is based on the yield management system and many tasks are outsourced, such as the maintenance of the rolling stock, catering, security and the call centre. The objective is clearly to keep costs low in order to have a lower CASK than the competitor while providing a high quality service.

6.1.2 Focus on the Rolling Stock

Italo initially ordered 25 brand new high-speed trains from Alstom with superior technical performances than the competitor's rolling stock. One important point is that the company made the innovative decision to omit the inclusion of a dedicated bar-restaurant car. Instead, two vending machines were added on each train (cars 3 and 7 in AGV trains, cars 3 and 6 in EVO trains) so that the company can still benefit from the income from these services. Additionally, on-board catering is offered in Prima and Club Executive, which is prepared in the galleys of the train.

In this way, an entire additional car can be fully destined to seating, increasing the overall capacity of each trainset. For instance, as EVO trains are fairly comparable to Trenitalia's ETR 600 (also from the Pendolino family), it can be pointed out that EVO trains feature 487 seats compared to the 432 of ETR 600 and hence enabling Italo to reduce CASK by 9%.

The EVO fleet was ordered to Alstom in 2015 with even a higher seating density than the AGV fleet. This fleet has a maximum speed of 250 km/h, compared to 300 km/h of the AGV fleet. The main reason is that the EVO fleet is intended to be deployed on the Naples/Rome-Venice and Turin/Milan-Venice links, which barely have stretches with maximum operating speed exceeding 250 km/h, with no relevant effects on travel times.

In this way, Italo acquired a less expensive fleet than the AGV fleet (partly explained by the lower maximum speed) with more suitable performances for certain routes of the network. As a consequence, the company will allocate all AGV trains in the HSL backbone Turin-Salerno, where the maximum speed can be reached, leading to a more efficient use of the company's resources.

Finally, the fact that the entire Italo fleet has been produced by a single manufacturer has seen positive repercussions on the efficiency in the maintenance costs as well.

6.1.3 Levels of Service and Fares

Italo has adopted a scheme with four levels of service (Club Executive, Prima, Comfort and Smart) and a pricing structure with three different fares (Flex, Economy and Low-cost) within the yield management system and also a number of promotional offers. Thus, the provision of a wide-range of offers covering most of the segments of users was made possible, from the most price-sensitive ones to the more demanding ones.

6.1.4 Target Audience

Since its launch, Italo has aimed at targeting a wide range of passengers, but it has especially persevered in its goal of targeting business travellers. This is the segment of users with the highest yields since they typically seek higher-end levels of service and flexible fares. Therefore, high-yield passengers are key drivers of revenues. With the purpose of making Italo appealing from them, NTV has made sure to provide a very high quality service in Prima and Club Executive, including a meeting room, on-board catering, fast track train access, a convenient loyalty programme and a high frequency of services, especially in the Rome-Milan link, which is currently served by two hourly services in each direction for most of the day, including a number of non-stop services. Besides, lounges for premium passengers are available at the main stations of the network (Florence SMN, Milan Central, Naples Central, Rome Termini, Rome Tiburtina, Turin Porta Susa).

6.1.5 The Network Strategy

The network strategy is another item that has to be analyzed. The company was born to operate in the backbone of the Italian HSR network, from Turin, Milan and Venice to Rome, Naples and Salerno, which sees the highest demand in the country and serves more than 60% of Italy's population. However, it is interesting that Italo showed interest to operate services in the Milan-Bologna-Rimini-Ancona route as well, and so did, from December 2013 to December 2014. It is also worth noting that Trenitalia decided to launch Frecciarossa services in the same link after NTV announcement.

This lower demand route is more focused to leisure trips (typically lower yielding) compared to, for instance, Milan-Rome, which is more business-heavy (higher-yield). In fact, frequency is a key factor to appeal business travellers (Deutsche Magnet Bahn, 1993) and therefore, since NTV operated the route to the Adriatic with only three daily round trips, this seems to back up our hypothesis on the user profile in this route. After less than one year of operation, NTV board decided to withdraw from the route and hence it lasted only 12 months. This move has to be contextualized in order to better understand the company's strategy.

In 2014, RFI agreed to grant NTV access to Rome Termini station. Beforehand, not having access to the central station in Rome was a competitive disadvantage for the company, so this was a good opportunity to attract more users in the Italian capital in a moment when NTV was facing financial difficulties. Therefore, it seems that this context motivated the company to strengthen their presence in the higher-yield Rome-Milan route by doubling the number of daily non-stop round trip services from 3 to 6 with trains freed from the Adriatic route, which would be discontinued.

In any case, NTV resumed services to the Adriatic in August 2016 taking advantage of the large flows of people moving to the coast in peak season. Nevertheless, the service was limited to Milan-Bologna-Rimini and operated only from Friday to Monday. Since then, the service has not been resumed anymore.

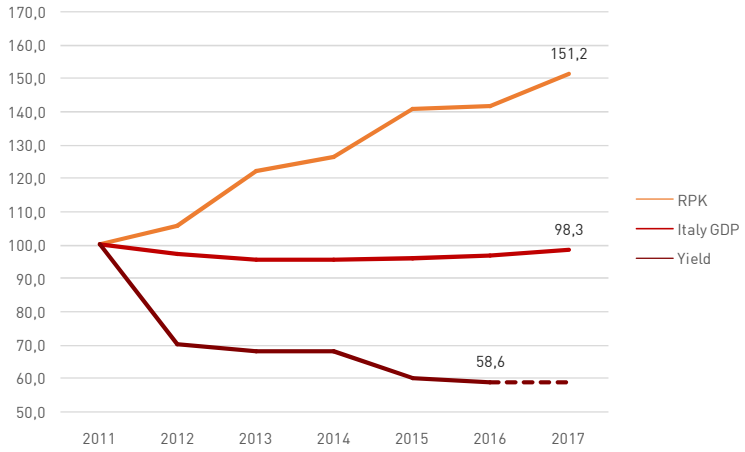
Regarding the overall network, NTV initially tried to make alternatives focusing on secondary stations in Rome and Milan and secondary lines such as Milan-Ancona, and ended up in the verge of bankruptcy. It was only in 2015 when they modified their strategy to focus on the central stations in Rome, Milan and Turin, along with allocating all their resources in the backbone Milan/Venice-Rome-Naples that the company saw a strong increase in ridership and finally became profitable.

6.2 Key Metrics and Financial Results

6.2.1 Introduction

According to some authors, GDP per capita is highly correlated with passenger traffic volume. Therefore, passenger traffic tends to stagnate or even decrease during the economic crisis. In the particular case of Italy, the country plunged into a deep recession just before NTV launched its first services and its GDP dropped by 4% from 2011 to 2015, while in 2017 it is still about 2 percentage points below 2011. Nevertheless, it is very interesting to evaluate the effects that rail competition has had on the HSR traffic in Italy as shown below (Exhibit 9).

Exhibit 9 | Total HSR Traffic (RPK), Italy's GDP and Yield from 2011 to 2017 (Indexed Against Data for 2011).



Source: TRA Consulting.

Total passenger traffic (RPK) increased by about 50% between 2011 and 2017 in the Italian HSR network. With regards to the previous statement of the relationship between traffic and GDP, it is seems reasonable to assume that at least a part of the increase in HSR traffic comes from other means of transport (air, road and conventional trains).

In the meantime, yields decreased by 40%. Therefore, this fact has clearly been the key driver for the increase in the HSR traffic. It is worth noting that prices already started to decrease within a few months of Italo's entry into the market.

Hence, it is of the greatest interest to analyze Italo's economic data and the main operational indicators in relation to its operational activity during this period in order to establish some substantial conclusions on HSR transport. Let us recall that we are focusing on Italo's particular case since it is the only example of a private open-access operator that competes with the state-owned incumbent on its HSR network up to date.

6.2.2 Quantitative Analysis

The following analyses are based on the available data from **Italo S.p.A. Financial Statements** from 2014 to 2017, and hence we have data from 2013, which was the first full year of operation of Italo, to 2017. All the data presented below are collected in Appendix 3. Remark: data is not always complete and clear and hence some estimates were required. In any case, any potential inaccuracies will not affect our conclusions.

First of all, the ridership and traffic (RPK) share are respectively presented below (Exhibits 10 and 11).

Exhibit 10 | HSR Ridership in Italy from 2011 to 2016.
Mpax

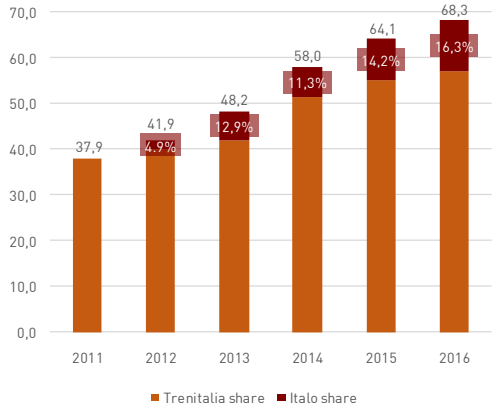
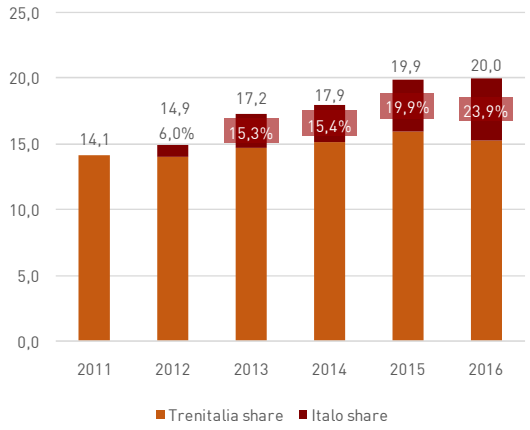


Exhibit 11 | HSR Traffic (RPK) in Italy from 2011 to 2016.
Bpax.kms



Source: own analysis with data from Italo S.p.A. and others.

Italo had a 24% traffic share in 2016, whereas the ridership share was near 16%, which means that the average trip of an Italo passenger is longer than Freccia's.

- **Key Operational Metrics**

Let us focus now on Italo's key operational metrics (Exhibits 12 to 14).

Exhibit 12 | Production of train.kms.
Mtrain.kms

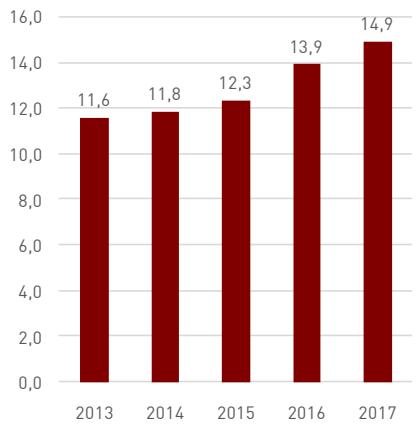
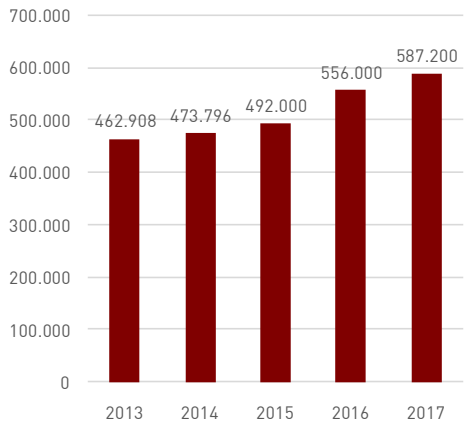


Exhibit 13 | Production of train.kms per Unit.
train.kms

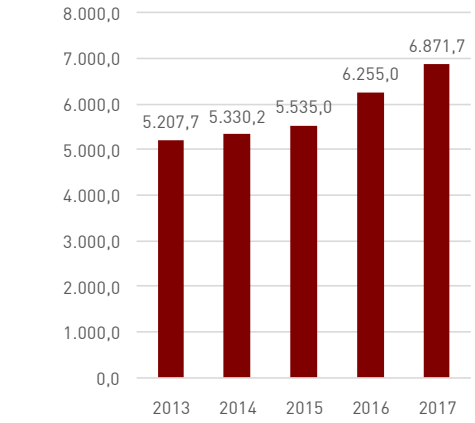


Source: own analysis with data from Italo S.p.A.

Observation: The production of train.kms is expressed in global terms (Exhibit 12) and for a unit train (Exhibit 13). The latter is obtained simply by dividing the production of train.kms by the fleet of 25 trains. Data from 2017 is estimated from the Italo 2017 first 9 months Interim Report. Otherwise, data from the 2017 Financial Statement would be distorted due to the launch of the first EVO trains in December 2017, resulting in a slight overestimation.

Exhibit 14 | Production of seat.kms (ASK).

Mseat.kms



Source: own analysis with data from Italo S.p.A.

- **Ticket Revenues Performance: Key Metrics**

Italo's ticket revenues performance is presented below (Exhibits 15 and 16).

Exhibit 15 | Ridership and Load Factor.

Mpax

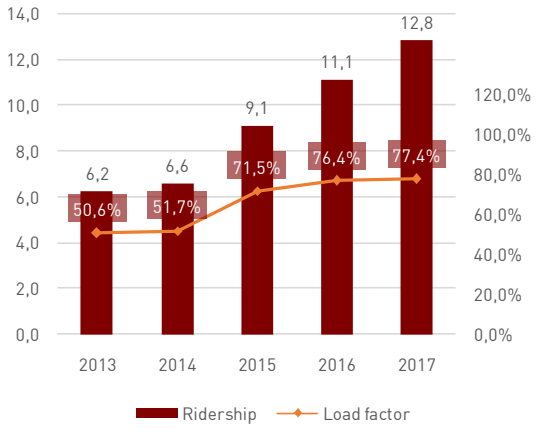
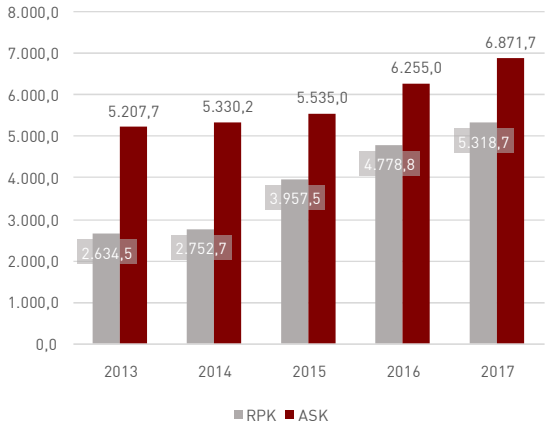


Exhibit 16 | RPK and ASK.

Mpax.kms and Mseat.kms



Source: own analysis with data from Italo S.p.A.

The average distance (i.e. the relationship between ridership and RPK) oscillates between 415 and 435 kilometres in this period and hence it can be assumed that the proportion between ridership and RPK is roughly constant.

- **Key Financial Metrics**

Italo's key financial metrics are presented below (Exhibits 17 to 21).

Exhibit 17 | Traffic Revenue and Yield.
M€ and €.cents/RPK

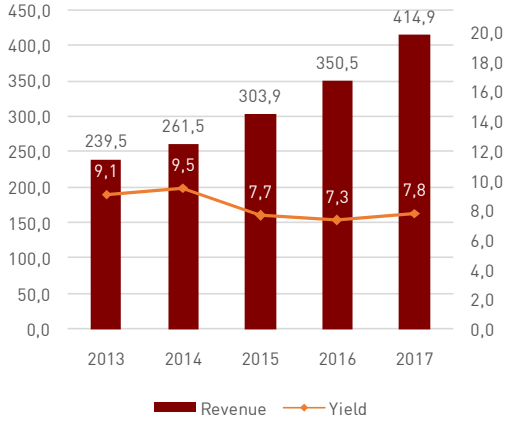


Exhibit 18 | Production Costs and CASK.
M€ and €.cents/ASK

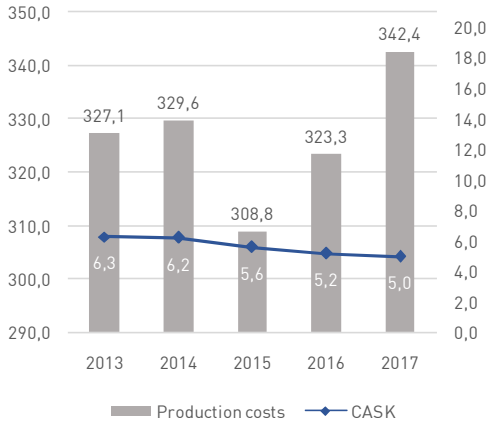


Exhibit 19 | EBITDA and Net Profit.
M€

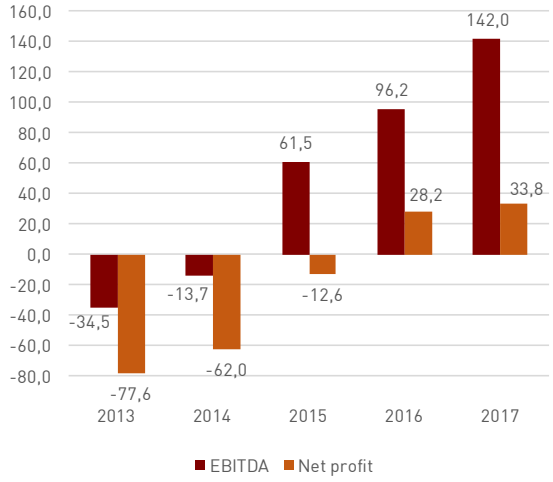


Exhibit 20 | EBITDA Margin.
%

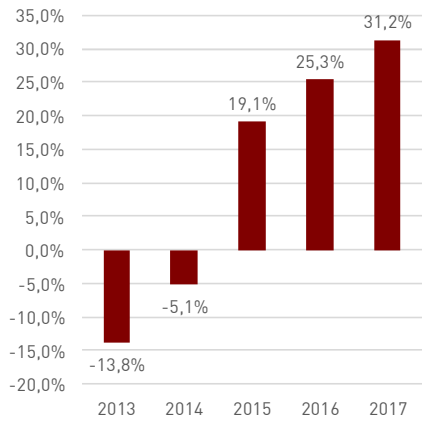
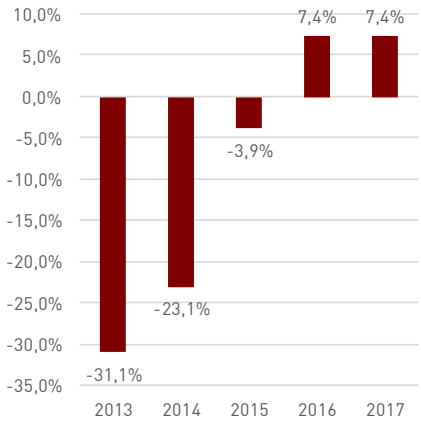


Exhibit 21 | Profit Margin.
%



Source: own analysis with data from Italo S.p.A.

The collected data above is now analyzed in relation to the company's activity in this period.

2014

Overview

The company's operating performance was below expectations in 2014, especially in terms of revenue from ticket sales. This made it necessary to revise the Business Plan for the period from 2015-2018 in order to assess the timescale and initiatives required to reach breakeven and decide on the actions to be taken in order to put the company on a sound financial footing.

On March 5th, a cost cutting programme was launched as NTV reached agreement with its five unions for about 1.000 contracts of solidarity that foresaw a cut in wages and a reduction in the number of company directors and their pays.

Operating activities

- 16 daily services were transferred to Rome Termini station on June 15th.
- Services on the Turin/Milan-Ancona link were terminated on December 15th.

Key Operational, Commercial and Financial Metrics

- ASK increased slightly by 2.4% with respect to 2013, due to the fact that the fleet of trains was entirely available in 2014, compared to 2013, as the ramp up was completed in March 2013.
- Ridership grew by 5.7%, not in line with expectations, probably influenced by the economic crisis, while RPK increased by 4.5%.
- Revenues increased by 9.2% due to the patronage growth and the yield increase (4.4%). According to Exhibit 9, despite the general tendency of strong yield decrease in this period, overall yields rather stagnated between 2013 and 2014.
- Costs remained stable in general despite the greater production of train.kms, due to the introduction of the cost cutting programme that made possible a 10% reduction in staff costs, offsetting the 2% increase in cost of services attachable to the increase in the production of train.kms.
- The EBITDA and the Net Profit improved but still in the red.

2015

Overview

Even thought at the end of 2015 NTV was still engaged in completing its turnaround plan approved in February 2015, the positive results achieved at the end of the year proved the validity of the course of action undertaken via implementation of the plan. The restructuration was based on strengthening the service offered by using the fleet more efficiently, and was supported by shareholders via a capital increase of €60 million. The main activities accomplished in 2015 include:

- Increase in capacity, from 48 to 56 daily services, with boosted services on the Rome-Milan link and the launch of new services to Verona. NTV was able to persuade Alstom to increase train availability, hence this made possible this production enhancement with the same fleet of trains.
- Launch of the new intermodal road-rail model, with Italobus connections launched from Reggio Emilia AV station.
- Access at Rome Termini, Milan Central and Turin Porta Nuova stations.
- Acquisition of eight new trains, to be delivered from 2017.
- Enhanced presence in stations via new automated ticket vending machines and the opening of dedicated ticketing spaces and lounges in Rome and Milan.
- Optimisation of onboard services and a new customer service model.

Additionally, other corporate initiatives were underway all aimed at further improving corporate performance and oriented towards further growth in supply, the development of Italobus services from other network stations, the increase in the number of stations served and the opening of new Lounge rooms. On the other hand, in 2015 NTV benefited from a 37% track access charges reduction approved by the Transport Regulation Authority.

Nevertheless, this progress was not a path of roses, as the new industrial plan initially forecasted to dismiss a quarter of the company's workforce, which cost the company a strike in April 2015.

Operating activities

- From June 2015, daily services to and from Rome Termini station were stepped up from 16 to 32, services from Rome Ostiense were terminated and services to Turin and Salerno were further expanded.
- In December, with the launch of the new winter timetable, several upgrades were turned on:
  - The overall Italo service grew from 48 to 56 daily services.
  - All Milan services were transferred from Garibaldi station to Central station and trains in Turin began to call at Porta Nuova station (in addition to Porta Susa).
  - New services to Verona were added.
  - The new intermodal road-rail model was launched with Italobus connections from Reggio Emilia AV station, which in turn saw Italo daily train services doubling from 12 to 23.
  - Introduction of varied new offers to travel with Italo.

Key Operational, Commercial and Financial Metrics

- ASK increased by 4.2% with respect to 2014 as a result of the actions undertaken to achieve a higher fleet usage.
- Ridership grew by 39.5%, from 6.6 million to 9.1 million (while RPK increased by 43.8%), due to the strengthening of the network and the introduction of the new Italobus services, registering a Load Factor of 71.5%, compared to 51.7% in 2014.
- Revenues from sales and services increased by 16.2% due to the patronage growth, even though yields dropped 19% to 7.7 €.cents/RPK. Regarding other

incomes, the company entered 8.7 M€ from EECs (the so-called White Certificates) (2.8% of the total revenue).
- Production costs and CASK decreased by 6.3% and 10% respectively, mainly driven by 1) the reduction of a number of items included in the cost of services, namely track access charges paid to the network operator in particular despite the increase in the production of train.kms., and 2) reduction in costs of raw materials, consumables and goods and staff costs. Conversely, some items such as other provisions and other operating costs increased significantly.
- The EBITDA was positive for the first time, whereas the Net Profit was still in the red.

2016

Overview

In 2016, the positive trend observed at the end of the previous year was confirmed, thus providing a positive outlook for the company as a result of the turnaround plan launched in February 2015. All key operational, commercial and financial metrics registered great tendencies and even the net profit was positive for the first time. Along with that, the network was further strengthened with steeped up services in the backbone of the network, new train services to Brescia, Ferrara and to the Adriatic (seasonal) as well as new Italobus connections from Milan Rogoredo and Salerno.

On the other hand, lounges were opened at Rome Termini, Rome Tiburtina, Milan Central, Naples Central, Turin Porta Susa and Florence, and at all network stations served, direct sales management was also strengthened, with automated ticket vending machines, sales points and mobile sales desks.

In December, four months ahead of the agreed timeframe, the current solidarity contract was cancelled, entailing full termination of the related effects from January 2017.

Operating activities

- In March, two daily Verona roundrip services were extended to Brescia.
- During August, weekend connections between Milan and Rimini were resumed.
- From December, with the launch of the new winter timetable, several upgrades were introduced:
  - Further expanded services in the Milan-Turin and Rome-Naples links.
  - Two daily round trip services to Venice began to call at Ferrara.
  - New Italobus connections from Milan Rogoredo station to Capriate and Orio al Serio Airport and from Salerno to Picerno, Potenza, Ferrandina, Matera and Taranto.

Key Operational, Commercial and Financial Metrics

- ASK increased by 13.0% due to the stepped up fleet usage. The average production of train.kms per unit train was then 556.000 kilometres per year compared to 474.000 kilometres in 2014 (+17.3%).

- Ridership grew by 22.0% to 11.1 million while RPK increased by 20.8%. As a result, the Load Factor reached 76.4%.
- Revenue from sales and services increased by 15.3% due to the patronage growth, whereas yields further decreased to 0.073 €.cents/RPK. Regarding other incomes, the company entered 15.5 M€ from EECs (4.1% of the total revenue).
- Production costs rose by 4.7%, proportionally less than both revenue and capacity growth leading to a further decrease in CASK to 5.2 €.cents/ASK, hence it was a good symptom of the effectiveness of the Business Plan actions approved in the previous year. The most significant increases were driven by 1) track access charges and traction energy (due to the increased capacity), 2) direct cost of sales (related to the increase in revenue), 3) staff costs and 4) provisions for potential losses. By contrast, provisions for risks and charges and charges for amortisation and depreciation were significantly reduced.
- The EBITDA increased by 56.4% and a positive Net Profit of €28.2 million was registered for the first time.

2017

Overview

The company kept on with the positive trends of the previous year and, as a result, it was decided to begin the process of listing the company's shares on the screen-based trading system managed by Borsa Italiana S.p.A. Even though the financial ratios significantly rose, the net profit saw a very limited growth due to the financial expenses incurred in relation to the refinancing of the company's capital structure, a move taken by the company in preparation for the Initial public offering.

Operating activities continued with the completion of all the initiatives intended to achieve the objectives established in the Business Plan, which has been implemented across all strategic growth areas.

Furthermore, the first four EVO trains were delivered to the company and entered in service with the new winter timetable in December, allowing boosting the network up to 68 daily services.

Operating activities

- The Italobus network was expanded with a new connection from Verona to Canazei ski resort (winter seasonal), with stops in Rovereto, Trento, Cavalesa, Predazzo, Moena, Vigo di Fassa and Pozzo di Fassa; another link from Salerno to Cosenza with two stops in Lauria and Sala Consilina; and extended Parma link (from Reggio Emilia) to Cremona.
- In December, new winter seasonal connections with ski resorts were launched: Courmayeur from Turin and Cortina d'Ampezzo from Venice.
- In December 7th, the first 4 trains in the new EVO fleet entered in service, allowing to further expand Italo's rail network up to 68 daily services with the new winter timetable, compared to 56 in the previous timetable. Therefore, services on the

Rome-Milan axis increased from 40 to 50, ensuring a train each 30 minutes in this link for most of the day.

Key Operational, Commercial and Financial Metrics

- ASK increased by 9.9% due to the stepped up fleet usage and the introduction of four new EVO trains at the end of the year.
- Ridership grew by 15.3% to 12.8 million while RPK increased by 11.3%. As a result, the Load Factor reached 77.4%.
- Revenue from sales and services increased by 18.4% due to the patronage growth, whereas yields slightly increased to 0.078 €.cents/RPK. Regarding other incomes, the company entered 32.8 M€ from EECs (7.2% of the total revenue).
- Production costs rose by 5.9%, proportionally less than both revenue and capacity growth leading to a further decrease in CASK to 5.0 €.cents/ASK, hence continuing on a very positive trend. The most significant increases were driven by 1) track access charges and traction energy (due to the increased capacity), 2) direct cost of sales (related to the increase in revenue) and 3) staff costs (as a result of the growth in the workforce to keep pace with the expanded offering and larger fleet and increases in other items, such as incentives for employees).
- The EBITDA increased by 47.6% and a positive Net Profit grew to €33.75 million.

6.2.3 Conclusions

For obvious reasons, this section of the thesis inevitably collects a lot of data and hence it is very convenient to summarize the information presented above and other relevant data and facts in order to better understand the trajectory followed by the company during this short but revealing period.

The Business Plan approved in February 2015, meant to overcome a very critical financial situation through an important turnaround to relaunch and develop the company is perhaps the key factor of these recent years of Italo's history. Based on the data presented above, from 2014 to 2017 there has been a significant improvement on the efficiency of the company, as it was able to increase the production of train.kms by 24% with the equal fleet size.

Indeed, one of the keys of the strategy pre-set in the industrial plan to boost revenues and balance sheet was to significantly expand NTV services productivity while keeping costs low. The main actions carried out to achieve so include the focus of operations on central stations in Milan and Turin, the strengthening of services in the Rome-Milan link and the addition of Verona into the network, and on the other hand, the launch of Italobus, which enabled NTV to expand the catchment area of its rail services and offset the lack of local and regional links which its competitor, by contrast, has.

This was particularly useful at Reggio Emilia AV train station as its functionality was broadened thanks to the new integrated bus connections, taking into account that this station is located away from the major cities within its catchment area.

On the other hand, the new business plan included the introduction of greater flexibility in terms of the on-board service provided. Now in AGV trains the number of cars offering Prima and Comfort can be adapted to meet demand (2+2 or 3+1, respectively). In fact, in 2013, one year after the start of operations, NTV decided to convert the fourth Prima car into a Smart XL car in order to adapt better to the user profile, which differed from the company initial expectations as a consequence of the economic crisis (today's Comfort class).

Furthermore, Italo's promotion played an important role as well in this relaunch stage. As part of the industrial plan, the company executed an aggressive marketing strategy as NTV had taken to television to advertise its services, engaged in a social media public awareness campaign and focused on special events to hook new customers and retain them. A clear example is the extraordinary stops scheduled at Milan Rho Fiera on the occasion of major events that take place in the fair.

Last but not least, the company's finances benefited from the decision of the Transport Regulation Authority to reduce track access charges for operation on the HSR network by 37%. This was possible due to the terms of the 2007 Financial Law, which granted RFI state funding to repay nearly all of the construction costs of the HSLs.

The positive financial results have only improved year after year since the launch of the turnaround plan. NTV has proved to be able to overcome its most difficult times and enjoys now a much better financial situation. As a consequence, the company decided in 2017 to begin the process of listing the Company's shares on the screen-based trading system (Mercato Telematico Azionario) managed by Borsa Italiana SpA.

These outcomes also suggest that there was considerable room for improvement in the management of the company during the period from 2012 to 2014.

Finally, the good performances achieved and the expansion of the fleet with the new EVO trains enabled the company to launch services on the Turin-Milan-Verona-Venice route in May 2018 and to further strengthen the routes already operated.

According to the latest available data (from 2017), Italo's yield was 7.8 €.cents/RPK, compared to 10.5 €.cents/RPK in Renfe's AVE in 2016 (Observatorio del Ferrocarril en España, 2016).

6.2.4 Risk Factors

Risk factors avowed by the company according to their financial statements are reproduced below.

Operational risks of the company include:

- Risks related to the manufacturer and maintenance provider for Italo's fleet.
- Risks related to maintenance facilities and interruptions to their operations.
- Risks related to information systems, network infrastructure and data protection.
- Risks related to industrial relations.

- Risks related to services provided by other suppliers.

Risks related to the sector in which the company operates include:

- Risks related to access and management of the infrastructure.
- Risks related to the utilization of rail stations.
- Risks related to changes in the fees for infrastructure access and in the cost of electricity.
- Risks related to the suspension or revocation of licenses.
- Risks related to changes in industry regulations.

Strategic risks:

- Risks related to the competition.
- Risks related to the concentration of the business in Italy and changes in the macroeconomic environment.
- Risks related to traffic volumes and changes in customer preferences.

Finally, the company also faces fare evasion risks and litigation risks.

6.3 An Approach to Costs Management

For the purpose of better understanding the structure of costs of Italo, an illustrative theoretical analysis based on a comparison between four operation models will be carried out: the low-cost airline, the French low-cost HSR, the traditional HSR and Italo (Table 13). However, it is not our purpose to suggest with this analysis that Italo should go into low-cost, since this is just for informative purposes. The topic of lower-cost offering will be discussed in Section 6.4.

OUIGO (pronounced "we-go") is the brand name of the French low-cost HSR service operated by SNCF, the first of this kind in Europe (and practically the only). Spain's Renfe has recently announced plans to start a similar concept of low-cost HSR service between Madrid and Barcelona.

From Table 13 it can be evidenced that Italo is fundamentally based on the traditional HSR model focused on the provision of high-quality services, but it incorporates some items similar to those adopted by the Low-cost airline model or by OUIGO to head the model towards a higher efficiency, thus having positive effects on operating costs. For instance, as mentioned previously, Italo outsourced a wide range of tasks, its trains have a higher seating density (although it keeps a common range of classes) and its commercial use is more intensive than traditional HSR.

But perhaps one of the most meaningful similarities is found with OUIGO when it comes to the network geography: both models focus on trunk routes and make a limited use of traditional lines with the purpose of guaranteeing robustness of the network. As previously stated, the conventional network is much more prone to incidents than the HSR network and hence the confinement of HST services to the HSR network has a significant impact on service reliability, which can be verified by comparing punctuality rates from different operators.

This issue has indeed considerable implications in operating costs due to the fact that better reliability enables operators to reduce turnaround times (and thereupon to increase the commercial use of the fleet) and user compensation costs due to delays, which is basically what Italo aims at.

On the other hand, it is worth noting that infrastructure charges in Italy do not favor or penalize in function of the station where the service calls at (similarly to Spain) unlike in France. Therefore, the fact that Italo initially operated from secondary stations in Rome and Milan had no relevant effect on track access charges. This is relevant in the sense that with the current infrastructure charges system in Italy, the possibility to reduce operating costs by calling at secondary stations instead of central stations is practically non-existent. By contrast, in France, this way of reducing charges is feasible, which is precisely one of the keys of the OUIGO model.

Table 13 | Overview of the General Features of a Low-Cost Airline, OUIGO, the Traditional HSR and Italo.

	Low-cost airline	OUIGO	Traditional HSR	Italo
Company origin	Launched from scratch; trad. airline's subsidary; regional or charter airline converting itself	Incumbent national, state-owned railway company (SNCF)	Incumbent national, state-owned railway company	Launched from scratch, private-owned
Company's legal form and carrier licence	Independent airline or traditional/charter, airline's subsidary	Business unit within SNCF. Operated under the SNCF's operator licence	Business unit within the company. Operated under the company's operator licence	Independent company. Own operator licence
Workforce origin	Hired by the LCA	SNCF workers moved to OUIGO on a voluntary basis. Younger on-board workers except the drivers	Ticket inspectors: older because they work is HSTs after promotion	Hired by Italo
Wages	Lower	SNCF's salary scale but younger workers mean lower fixed salary costs. Higher variable bonus related to on-board working time	Company's salary scale	Lower than competitor's (Trenitalia). It can increase thanks to a system of individual and collective bonuses. Profit sharing arrangement based on the company's results [1]
Working conditions	Hard	Simpler ticket inspection given basic fare table. Cooler, less demanding travellers. Main task on-board is care instead of ticket inspections.	Good	Good
Workforce's tasks	Multitasking	Multitasking: same workers welcome and inspect tickets at the station then possibly go with the train	Single task	Single task
Cabin crew	Limited	Basically 6 per single train; may vary along the route depending on needs. No apparent hierarchical distinction between on-board staff members	Average	Average
Relationship with unions	Banned as much as possible	No clash but most unions did not support OUIGO at the launch	Regular, institutional relationship	Regular, institutional relationship

	Low-cost airline	OUIGO	Traditional HSR	Italo
Outsourcing	Intensive	Cleaning only	Cleaning only	Intensive: rolling stock, catering, security and the centre
State aids and incentives	For specific airlines including Ryanair	None	Local or regional authorities may contribute to operational costs	None
Load factor	Higher than for traditional airlines	88% in 2016	Around 70%	Around 75-80% in 2016-2017
Infrastructure charges	Often lower (secondary airports or dedicated terminals)	Lower because services do not start or terminate at one Paris central station	Higher	Higher [2]
Planes/trains use	Intensive	More intensive (12 hours per day)	Not intensive	More intensive (11 hours per day) [3]
Planes/trains	Single aircraft type. Single class but extra fee for best seats	Updated double-deck rolling stock: single class layout, no buffet car	Traditional rolling stock: two, three or four classes and buffet car	Traditional rolling stock: three/four classes and no buffet car
Seat density	High. Less space for legs	More seats per trains (single class, no bar) and per carriage (no luggage rack). Nevertheless, more space between seats	Average	More seats (no on-board bar, vending machines and galley instead). Average pitch
Schedules	Long operational times	Long operational times	Subject to routes	Subject to routes
Target audience	Leisure	Leisure	All passengers but focus on high-yield ones	All passengers but focus on high-yield ones
Routes operated	Mix of trunk routes and niche routes (subject to airlines)	Trunk route to the Mediterranean, avoiding central stations at Paris and Lyon	Mix of trunk routes (often extended beyond HSLs) and of inter-regional services	Trunk routes from Rome and Milan.
Airports/stations served	It depends on the airlines, typically regional or secondary airports, or dedicated terminals within large airports	Paris: no central station, only peripheral station served. Lyon: most trains avoid central station and call in the peripheral station. Other stations: no distinction	Central stations. Peripheral stations served only if it makes sense	Central stations. Both central and secondary stations served complementary in Rome, Milan and Naples
Tracks	-	Limited use of traditional lines	Mix of high-speed and conventional lines	Limited use of traditional lines
Connections	None	None	Yes: integrated tickets and timetables optimised to some extent	Yes: integrated tickets and timetables optimised to some extent

	Low-cost airline	OUIGO	Traditional HSR	Italo
Bookings	Internet or by phone (premium fare)	Internet and smartphone only	Internet, (smart)phone, stations and travel agents	Internet, (smart)phone, stations and travel agents
Ticket	e-Ticket. Compulsory self-printing or smart-phone-based e-ticket	e-Ticket. Compulsory self-printing or smart-phone-based e-ticket	e-Ticket, self-printing or printed	e-Ticket. Self-printing, printed or smart-phone-based e-ticket

[1] Source: Desmaris, 2016
[2] Refer to the explanations in the text.
[3] Author's estimations based on Italo's timetables.
Source: adapted from Delaplace and Dobruszkes (2015), Italo column is own analysis.

Regarding the ticket distribution system, Italo's business model abandoned the concept of the traditional ticket offices and adopted an overwhelmingly digital system aiming at reducing sales commissions. Nevertheless, aside from the options to purchase tickets via website, mobile site, Italo Apps and self-service ticket sales machines in Casa Italo, tickets can also be acquired through the call centre (outsourced, with no sales fee) and at the welcome desk for assistance and information in Casa Italo (in the main stations served), although its staff is responsible for multiple tasks in addition to ticket sales.

NTV management introduced an incentive-based remuneration model for staff. The share of individual and collective incentives in the remuneration is high, under an exception to national law. The total salary can increase by up to 25% above the base under a system of individual and collective bonuses. There is also a profit sharing arrangement based on the firm results (Desmaris, 2016). On the other hand, the personnel of Italo is, on average, younger than Trenitalia's and therefore it can be deemed that Italo can assume slightly lower expenses per employee.

Once completed this qualitative review, let us have a look at the following quantitative analysis. Operating costs from **Italo S.p.A. Financial Statements** are broken down as follows:

- Amortisation, depreciation and impairments: depreciation of rolling stock (30-year accounting depreciation), depreciation of other property, plant and equipment and amortization of intangible assets.
- Train management: rolling stock maintenance, Nola plant operating costs, cleaning costs for trains, plant and stations and other train costs.
- Track access charges and traction energy: fees paid to the railway infrastructure operator for access costs and electricity costs for the fleet.
- Commissions and fees: includes ticket sales commissions and commissions and fees charged by banks and payment providers.
- Other operating costs: rest of items, including raw materials, consumables and goods, services (technical consultants, outsourced services, promotional costs, insurance expenses, utilities and onboard connectivity, external providers of transport, travel expenses for personnel, fees paid to consultants, freelance personnel and directors, staff catering, security and surveillance), lease expense,

provisions, change in inventories of raw materials, consumables and goods and other operating costs.

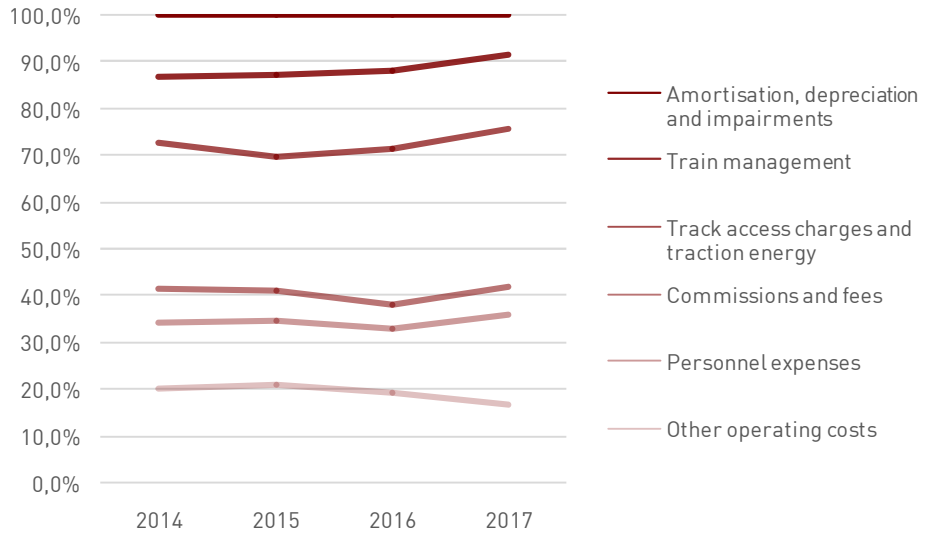
It can be assumed that all costs are fixed within the company's structure except of track access charges and traction energy that depend directly on the production of train.kms. The evolution of each item from 2014 to 2017 is displayed below (Table 14 and Exhibit 22).

Table 14 | Italo Operating Costs Breakdown from 2014 to 2017.

Description	2014	2015	2016	2017
Amortisation, depreciation and impairments	43,8	39,9	38,4	29,0
Train management	46,7	53,1	53,9	53,6
Track access charges and traction energy	101,7	89,4	107,3	116,7
Commissions and fees	24,5	20,0	17,9	19,6
Personnel expenses	46,1	42,0	43,4	66,0
Other operating costs	66,7	64,3	62,4	57,0
Total	**329,6**	**308,8**	**323,3**	**341,9**

The data presented is not totally consistent because data from 2017 Financial Statement is decomposed differently than in previous years, with some items being reclassified and shifted under other categories. Therefore, the author had to make some adjustments.
Source: own analysis with data from Italo S.p.A.

Exhibit 22 | Italo Operating Costs Breakdown Share from 2014 to 2017.



Source: own analysis with data from Italo S.p.A.

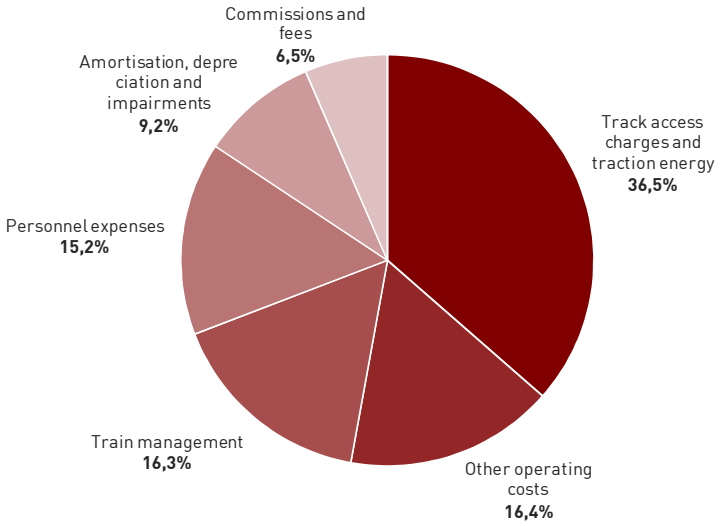
In order to make an in-depth analysis on Italo's operating costs, the cost breakdown individualized for a single train and for a single seat is presented below (Table 15 and Exhibit 23). The following data is specific for the AGV fleet, so as to avoid distortions as a result of the beginning of EVO fleet operations in December 2017, data from the **Interim Report for the nine months ended - 30 September 2017** are taken.

Table 15 | Italo AGV Operating Costs Breakdown (9M 2017).

Description	Total (M€)	Total per train and km (€/train.kms)	CASK (€.cents/ASK)	Indexed to 100
Amortisation, depreciation and impairments	21,6	2,0	0,43	9,2
Train management	38,5	3,5	0,76	16,3
Track access charges and traction energy	86,0	7,8	1,69	36,5
Commissions and fees	15,3	1,4	0,30	6,5
Personnel expenses	35,8	3,3	0,70	15,2
Other operating costs	38,6	3,5	0,76	16,4
Total	235,9	21,4	4,6	100,0

Source: own analysis with data from Italo S.p.A.

Exhibit 23 | Italo AGV Operating Costs Break Down (9M 2017).



Source: own analysis with data from Italo S.p.A.

It is worth noting that, according to the data used, CASK turns out to be even lower than what was estimated in Exhibit 18. The increment at the end of the year 2017 is probably related to the beginning of EVO fleet operations.

Track access charges corresponds to approximately 28% of the total operation cost (after deducting traction energy), which is fairly comparable to the HSR operation experience in France or Spain, and it is roughly the main cost driver that is generally not viewed as controllable by the train carrier. As it was pointed out previously, the decision to reduce track access charges by 37% as of 2015 played an important role in the amelioration of the company's finances and in the achievement of a more competitive CASK. Hypothesizing that this reduction did not take place, overall costs would increase by 17% (resulting in 25 €/train.kms and 5.4 €.cents/ASK).

On the other hand, train costs (corresponding to the amortization of rolling stock and train management) account similarly for 25.5% of the total costs, which proves the importance of evaluating the selection of these assets in terms of the commission cost of rolling stock and its associate maintenance plan. Italo seems to have benefited from a competitive unitary

purchase cost by ordering a fairly large fleet of trains, in contrast to having started operations with a smaller fleet, which would probably result in a higher cost per train. Furthermore, the company has fully outsourced the maintenance of its fleet of trains to Alstom, which presumably has helped to further adjust overall train costs.

Additionally, Italo has focused on commissions and fees as well, which is a rather minor component of the total cost (near 6.5%), by adopting a particularly digital ticket distribution system similar to those of low-cost airlines.

Nevertheless, it is not possible to make in-depth comparisons with Freccia HSR services since Trenitalia's financial statements do not disaggregate its revenues and costs by market segment (Desmaris, 2016). In fact, it is common for transport companies to display CASKs that aggregate other costs and to have different accounting policies that bedevil attempts to compare CASKs.

Furthermore, if we were to compare Italo's costs with those of other operators, this would not be the best approach to operating costs as it does not really give us a deep insight into it nor identifies concrete levers to reduce them. A bottom-up view of the unit costs, volumes and productivity of the cost bucket would be more suitable for this purpose. In any case, the adopted approach is enough indicative to get an insight into the HSR transport industry.

- **Effects of Double Composition of Trains on Operating Costs**

Double compositions is indeed a method to operate trains more efficiently since despite the seat capacity is doubled, some items do not see its respective costs increase proportionally to the composition size. Basically, it is about track access charges and staff costs.

On one hand, according to the Prospetto Informativo Rete 2018, track access charges for double compositions are only affected by the train weight component, as the composition may fall into a different category due to the increased weight, resulting in a rather small increase in charges. This factor seems to encourage operators to run longer trains.

With regards to the cost of traction energy, it is assumed that it is directly proportional to the train energy consumption. In a theoretical approach, this depends on a wide range of factors, such as the line profile, the driving style, wind and external temperature among others in addition to the actual speed and the train weight (García Álvarez, 2010). In a simplified approach assuming that traction energy is directly proportional to the train weight, it can be assumed that the traction energy doubles.

Finally, a double composition saves one train driver and in some cases it can be assumed that it saves a conductor as well. As a result, there is an additional, minor cut in operating costs.

Taking into account the previous hypotheses and assuming that double compositions are run with the company's own current resources, the reduction of CASK in a double composition can be estimated with the pertinent computations (Table 16).

Table 16 | Italo AGV Operating Costs in Double Composition Breakdown.

Description	Total per train and km (€/train.kms)	CASK (€.cents/ASK)	Indexed to 100
Amortisation, depreciation and impairments	3,9	0,43	9,2
Train management	7,0	0,76	16,3
Track access charges and traction energy	9,5	1,03	22,1
Commissions and fees	2,8	0,30	6,5
Personnel expenses	6,0	0,65	13,9
Other operating costs	7,0	0,76	16,4
Total	**36,2**	**3,9**	**84,4**

Index 100 is the average operating cost of a single composition trainset.
Source: own analysis with data from Italo S.p.A.

From these results it can be estimated that double compositions make it possible to reduce CASK by approximately 15-16%.

Nevertheless, Italo has not operated multiple compositions so far due to the fact that it does not really have spare trains since the fleet use is already intensive. Therefore, this can only be understood from a business view point as a part of the company's strategy in which frequency of service is prioritized over double compositions.

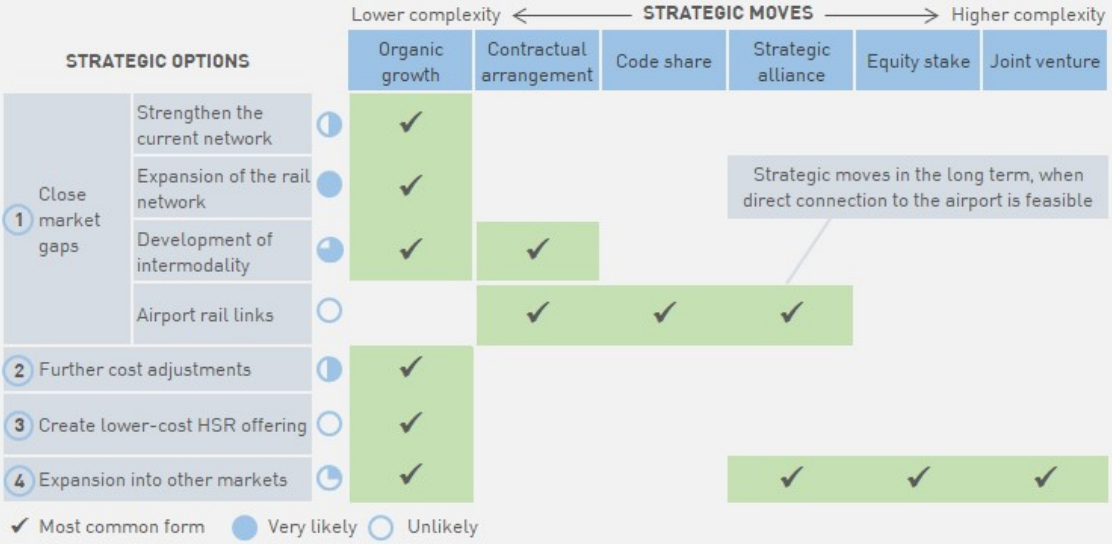
By contrast, the French low-cost HSR OUIGO often operates double compositions, due to its strategy to provide a very high capacity (1.268 seats) and a low frequency of service with the aim to benefit from the reduction in track access charges per passenger and hence reach a very low CASK. But here the point is that OUIGO, unlike Italo, is focused on leisure users (more sensitive to the ticket price), for which frequency and optimum schedules are much less valued (Deutsche Magnet Bahn, 1993).

In any case, the implementation of double compositions must be carefully assessed since depending on the situation, the gain in efficiency on one side may result in inefficiency on the other side. For instance, a double trainset travelling from Salerno to Turin may run fully loaded between Rome and Milan while half empty between Salerno and Rome and between Milan and Turin, resulting in an overcapacity issue.

6.4 Growth Opportunities

The purpose of this section is to reach a better understanding of the situation that Italo is currently facing in terms of competitiveness and its position in the rail transport market. Therefore, a comprehensive analysis on the strategic moves available for its development focused on business growth has been carried out (Exhibit 24).

Exhibit 24 | Available Moves for Each Strategic Option.



Source: own analysis.

1) Close market gaps. The following options are available for the company:

1.1) Strengthening of the current network. The market has already been widely covered since the beginning of competition. Further expansion depends on the evolution of the demand growth trend and on capacity constraints in the *Direttissima* Rome-Florence (the backbone of the network), currently limited to 8 trains per hour on each direction (PIR, 2018) with the SCMT security system. The implementation of the ERTMS, which will allow to significantly increase the capacity of the line, is due to be executed in the upcoming years. Short term HSR service expansion in the Salerno/Naples/Rome-Milan/Turin/Venice/Verona routes most likely will focus on reinforcement of service in certain hours of the day.

1.2) Expansion of the rail network. Scheduled expansion beyond the current network includes the introduction of Italo in the Turin-Milan-Verona-Padova-Venice axis (with potential extensions to Trieste) and the launch of services to Trento and Bolzano in the Trentino-Alto Adige/Südtirol region, most likely as extensions of existing Verona services. Other opportunities include the launch of services to Genoa. In fact, in early 2017, NTV requested slots to RFI to operate a daily round trip from Rome to Genoa via Florence, Bologna and Piacenza, but did not get clearance due to the capacity constraints in the

Direttissima Rome-Florence mentioned above. Nevertheless, in 2018, Italo requested slots to operate Rome-Milan via Florence, Pisa, La Spezia and Genoa instead. Nonetheless, Italo is prone to confine most of its services within the HSR network infrastructure in order to guarantee its network robustness and the efficiency of the fleet, hence new links using long stretches of conventional lines (which somewhat is the case of Genoa links) are rather unlikely. Besides, the short term priority is to establish a competitive service in the new Turin-Milan-Venice link especially in terms of frequency upon delivery of the new EVO trains to the company, as Trenitalia already operated up to 23 daily trains in each direction between Milan and Venice with a number of extensions to Turin, Genoa, Trieste and Udine prior to Italo services launch. In any case, any Italo potential service to Genoa is likely to be limited to one daily round trip, similarly to Trenitalia's Frecciargento services to the Liguria.

1.3) Intermodality development. The current intermodal model is fundamentally based on the Italobus network integrated to the Italo HST service, which has proven to be quite a success. It is convenient to highlight the main advantages of the model, which include the little investment required (with low associated risks) and the flexibility of its implementation. Therefore, the company is likely to further expand Italobus services with new destinations including airports, boosting feeding traffic and improving the capillarity of the overall network. Agreements with bus companies to provide feeding can also be considered. However, agreements with local or regional Trenitalia units are improbable.

1.4) Airport rail links. Their possibilities are very limited at present due to technical constraints at the major airports (e.g. Rome Fiumicino, Milan Malpensa, Venice Marco Polo), but it could be feasible in the longer term with the construction of new dedicated rail links. Therefore, in the future scenario when it will become practicable, Italo can consider to extend the pertinent HSR services based on demand studies and to establish agreements with airlines operating at those airports, through alliances or code sharing. In order to provide a high-quality service, the agreement can consider setting up check-in counters at selected stations in the HSR network and provide checked through luggage between the rail and air journeys. It is reasonable to expect that, at this stage, the competitor will very likely aim at pursuing the same kind of operations and agreements.

Some estimates can be made with the purpose of sizing the market gap for HSR regarding feeding traffic in Italy (by air) to long-haul destinations. Feeding traffic is currently based on Alitalia's short-haul network from its hub at Rome Fiumicino Airport. It is worth noting that the network includes some very short-haul routes, including Pisa (258 km), Florence (239 km from Rome), Bologna (313 km), Naples (199 km) (all according to the Great Circle Distance), all of them with four daily round trips equally timed with the main medium and long-haul departure and arrival banks at Fiumicino Airport. These links are fundamentally targeting connecting traffic and carry near to zero point-to-point traffic since it is clear that HSR services are far more convenient for this aim both in terms of travel time and ticket price. Many other longer domestic links overlapping the HSR network (Milan, Turin, Venice, Verona…) are scheduled similarly (often with greater frequencies) and carry large amounts of connecting traffic as well.

Therefore, taking into account the airports of the cities directly connected to Rome by HSR (Turin, Milan Malpensa, Milan Linate, Verona, Venice, Bologna, Florence and Naples) and assuming that the overwhelming majority of its traffic to Rome is feeding, the traffic was

near 3 million passengers in 2017 according to the ENAC. As a comparison, Italo and Frecce carried altogether near 63 million passengers in 2016. Nevertheless, the estimated traffic is not the actual size of the potential market of an airport HSR link (in this case to Rome Fiumicino Airport), as it does not take into account feeding traffic by other means of transport or future agreements with airlines.

2) Further operating costs adjustments. Taking into account the cost cutting programme carried out as part of the turnaround plan launched in 2015, it can be assumed that, presumably, there is no significant room for additional cuts (concerning those that depend directly on the company's will). Therefore, the only realistic way to do so on a relative basis is by enhancing production, with respective increases in both workforce and fleet size. On one hand, the company may hire younger employees, which means lower fixed salary costs (on Italo's salary scale), and on the other hand, the increase in the fleet size may benefit from economies of scale relying in some fixed cost items. Nevertheless, in any case, these actions must be earmarked for a well-defined expansion plan.

3) Introduction of low-cost HST services. Based on the limited experience in this topic, low-cost HSR is aimed at offering a differentiated product with lower fares than traditional HSR focused on price-sensitive users so as to make HSR transport more accessible. Nonetheless, rail competition in Italy has already brought a significant reduction in ticket price along with a wide range of promotional offers and hence making HST services affordable for most of the potential users. On the other hand, it has been previously seen that operating from secondary stations instead of central stations has no relevant effects on HSR service operating costs on the Italian railway network. Besides, competition will most probably keep growing for many years as Italo expands its network and adds more services. Therefore, the introduction of low-cost HSR services in the current scenario is not realistic. Also, from the operator's point of view, there is no point in further decreasing yields.

4) Expansion into other markets. In October 2017, Italo launched its international expansion when applied for the UK Rail Franchising PQQ Passport, which was obtained from the Department for Transport in March 2018 and allows the company to participate in tenders regarding rail transport throughout the United Kingdom. The operator may participate in franchise competitions by itself or by means of an agreement with other companies. Nevertheless, these events are quite recent and hence further analysis will be needed to bring substantial conclusions.

7

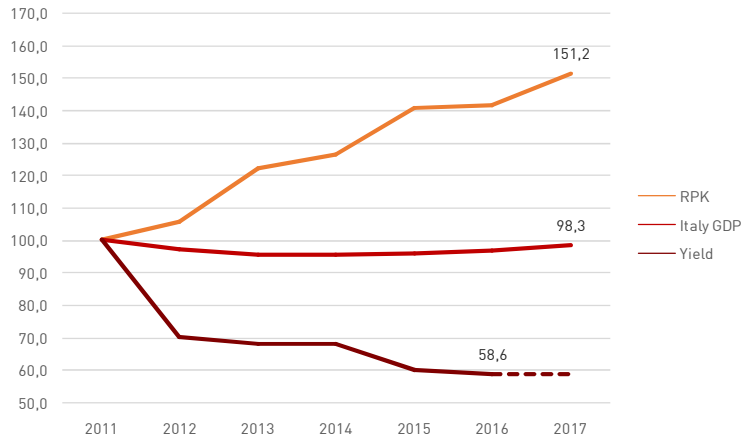
The Main Outcomes of Competition in Italy

7.1 Effects on HSR Demand

In order to better appreciate the impact of Italo in the overall passenger transport system, it is convenient to review the outcomes of competition especially in relation to the incumbent Trenitalia and to the domestic inland air traffic.

As it was previously stated, HSR has seen a sharp increase in traffic mainly driven by the widespread drop in ticket price since the beginning of competition (Exhibit 25), which even started to decrease within a few months before Italo services launch.

Exhibit 25 | Total HSR Traffic (RPK), Italy's GDP and Yield from 2011 to 2017 (Indexed Against Data for 2011).



Source: TRA Consulting.

The evolution of traffic broken down by operator is reproduced both in terms of ridership and RPK below (Exhibits 26 and 27).

Exhibit 26 | HSR Ridership in Italy from 2011 to 2016.
Mpax

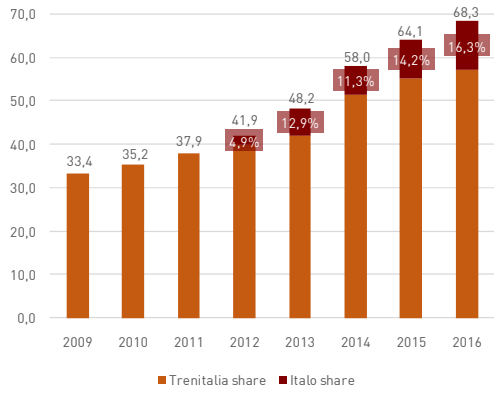
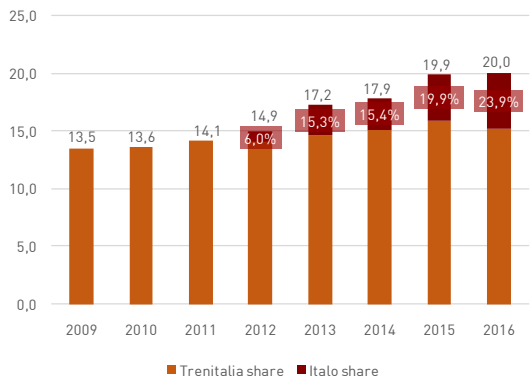


Exhibit 27 | HSR Traffic (RPK) in Italy from 2011 to 2016.
Bpax.kms



Source: own analysis with data from Italo S.p.A. and others.

It is interesting to note that Trenitalia did not reduce its HSR supply and even increased ridership despite the launch of the competitor's service.

Passenger traffic data broken down by corridors is not available and hence it is not possible to estimate traffic share per corridor and neither the ASK per corridor due to the variety of rolling stock operating in the network and the fact that an undetermined number of service operates in double composition. Nevertheless, an approximation of the current share of each company based on the number of services in a number of links can be established (Table 17).

Table 17 | Share of Italo Services in Major Links with Competition (in Each Direction).

Route (N-S and W-E)	Trenitalia	Italo	Italo share
Turin-Rome	19	9	32,1%
Turin-Naples	9	4	30,8%
Turin-Salerno	4	2	33,3%
Turin-Venice	6	3	33,3%
Milan-Venice	18	5	21,7%
Milan-Rome	51	25	32,9%
Milan-Naples	33	13	28,3%
Verona-Rome	8	3	27,3%
Verona-Naples	2	2	50,0%
Venice-Rome	17	8	32,0%
Venice-Naples	6	5	45,5%
Florence-Rome	52	27	34,2%
Florence-Naples	24	16	40,0%
Rome-Naples	45	20	30,8%
Rome-Salerno	12	5	29,4%

According to timetables for the first week of June 2018 on an average weekday.
Source: own analysis with data from Italo S.p.A. and Trenitalia S.p.A.

The average Italo supply share is about 32.5%. This value turns out to be fairly similar to its RPK share, which according to Italo S.p.A. it was 35% in 2017. This value supposedly counts the traffic strictly on HSL since it is significantly greater than the RPK share displayed in Exhibit 27, which counts Frecce entirely.

On the other hand, further comparisons in terms of overall daily round trips and fleet size can be drawn respectively (Exhibits 28 and 29).

Exhibit 28 | Italo and Frecce Daily Round Trips.

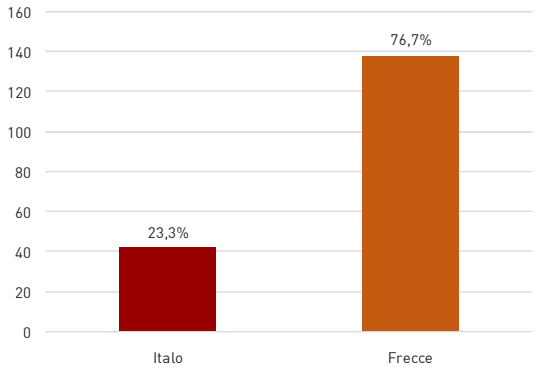
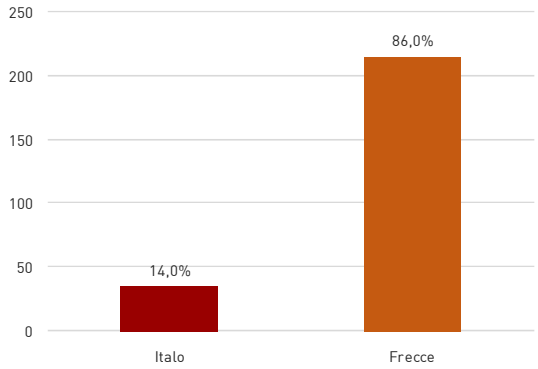


Exhibit 29 | Italo and Frecce Fleet Size.



According to timetables for the first week of June 2018 on an average weekday.
Source: own analysis with data from Italo S.p.A. and Trenitalia S.p.A.

7.2 Effects on Air Transport Demand

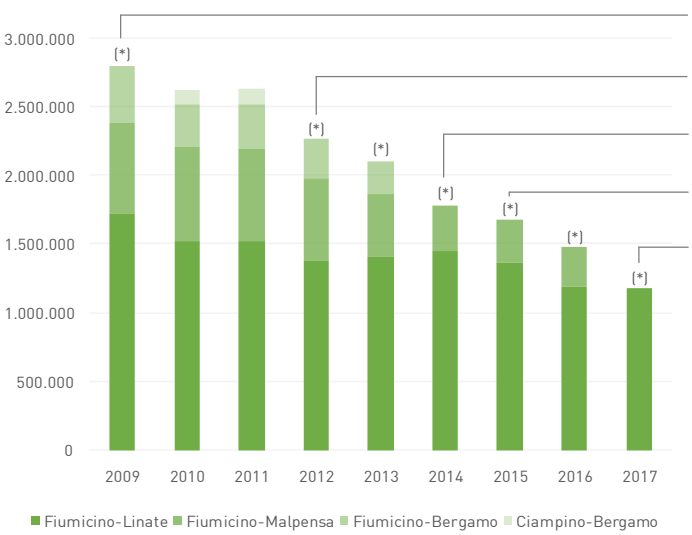
Since it was assumed that at least a part of the increase in traffic comes from other means of transport, it seems convenient to observe the evolution of air traffic in domestic links where there is HSR service in order to better grasp the effects of competition in the modal share. The evolution of demand by other means of transport such as road or conventional railway cannot be assessed due to the lack of specific data.

It is known from traffic data already presented that since the full completion of the backbone Turin-Salerno in 2009 until the beginning of competition, the overall HSR traffic saw a sharp increase. Therefore, data series will be set back to 2009 so as to better interpret the impact of competition, which began later in 2012.

Air traffic in inland domestic links with more than 100.000 passengers per year (in both directions) with HSR service in competition is presented below, listed from the busiest route to the least busy route (Exhibits 30 to 40). All the data in here are collected in Appendix 3.

Note: data from the ENAC only lists links with more than 50.000 passengers per year in each direction. Therefore, there is no data available for links below this traffic and in some cases such as the Rome-Milan link, traffic is not accurate in the years in which part of the data was not available (hence the error can be up to +100.000 passengers per year), but it is enough indicative. These cases are labelled with an asterisk in the respective figures.

Exhibit 30 | Air Traffic in Rome-Milan (2009-2017).
Pax



March 2009: the Rome-Milan HSL is now fully completed.

April 2012: competition between NTV and Trenitalia begins.

March 2014: Ryanair terminates the Ciampino-Bergamo route.

October 2015: Easyjet terminates the Fiumicino-Linate route.

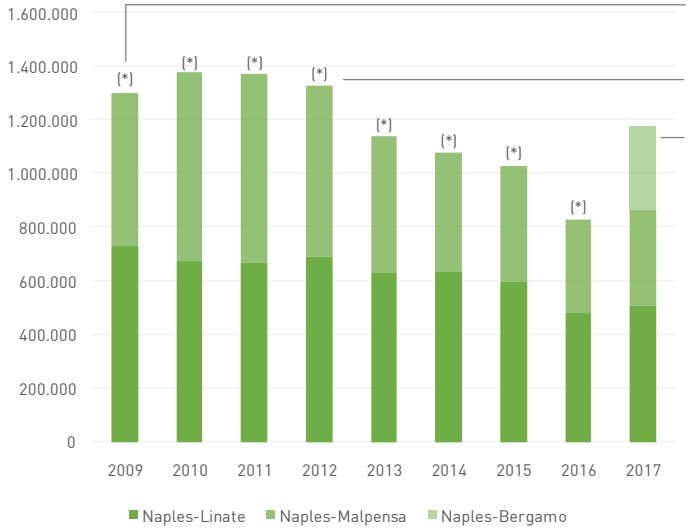
February 2017: Alitalia terminates the Fiumicino-Malpensa route.

October 2017: Easyjet terminates the Fiumicino-Malpensa route.

Source: own analysis with data from ENAC and others.

Exhibit 31 | Air Traffic in Naples-Milan (2009-2017).

Pax



March 2009: the Naples-Milan HSL is now fully completed.

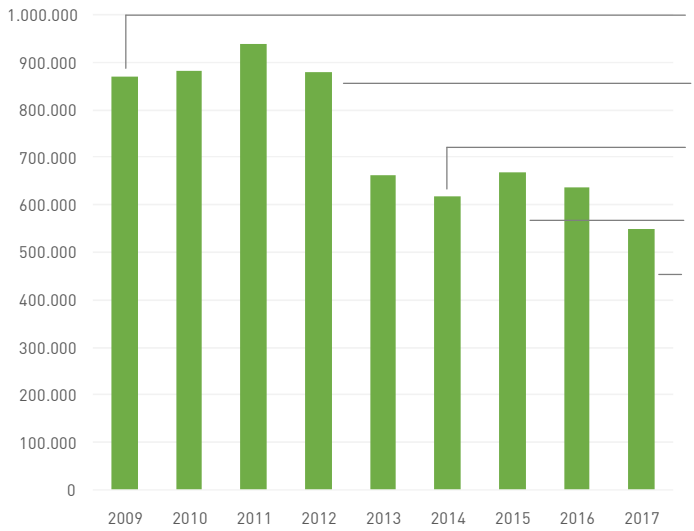
April 2012: competition between NTV and Trenitalia begins.

May 2017: Ryanair launches 4 daily round trips Naples-Bergamo.

Source: own analysis with data from ENAC and others.

Exhibit 32 | Air Traffic in Rome-Turin (2009-2017).

Pax



December 2009: the Rome-Turin HSL is now fully completed.

December 2012: competition between NTV and Trenitalia begins.

September 2014: Vueling launches 3-4 daily round trips Rome-Turin.

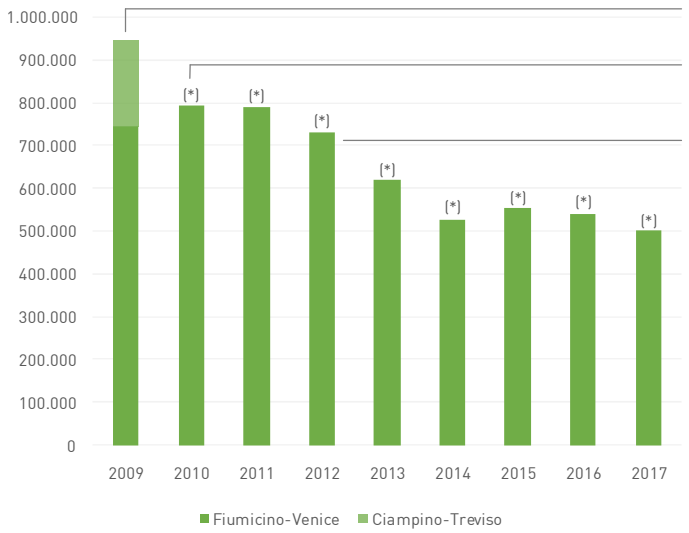
October 2015: Vueling terminates the Rome-Turin route.

October 2017: Blue Air terminates the Rome-Turin route.

Source: own analysis with data from ENAC and others.

Exhibit 33 | Air Traffic in Rome-Venice (2009-2017).

Pax



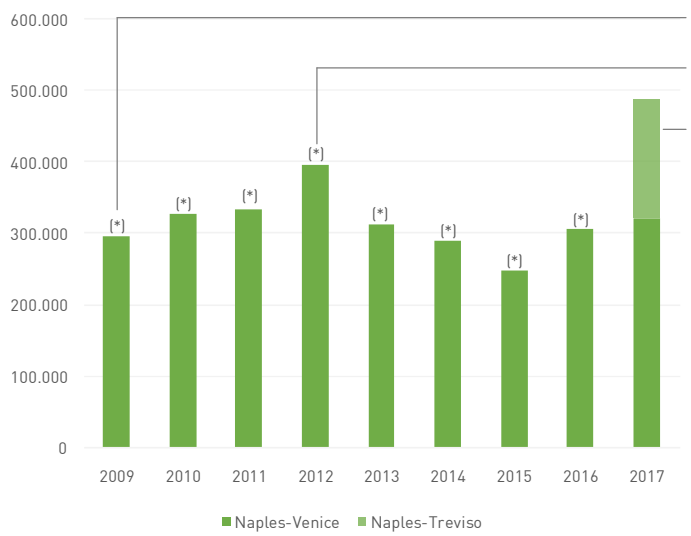
March 2009: the Rome-Bologna HSL is now fully completed.

March 2010: Ryanair cancels the Ciampino-Treviso route.

October 2012: competition between NTV and Trenitalia begins.

Source: own analysis with data from ENAC and others.

Exhibit 34 | Air Traffic in Naples-Venice (2009-2017).
Pax



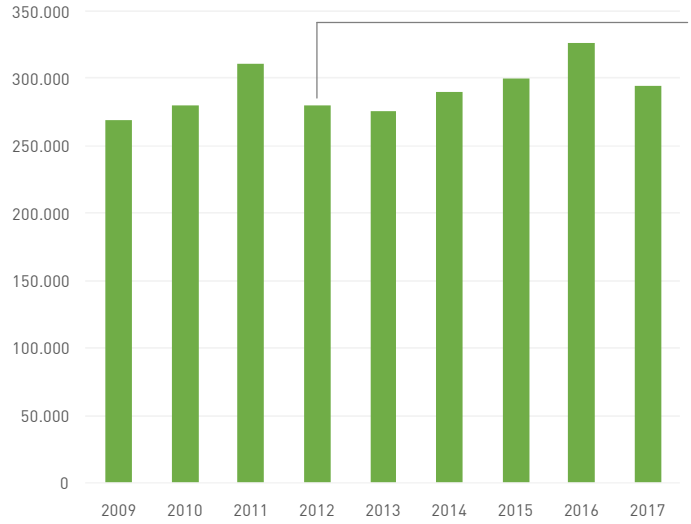
October 2012: competition between NTV and Trenitalia begins.

March 2009: the Naples-Bologna HSL is now fully completed.

April 2017: Ryanair launches 2 daily round trips Naples-Treviso.

Source: own analysis with data from ENAC and others.

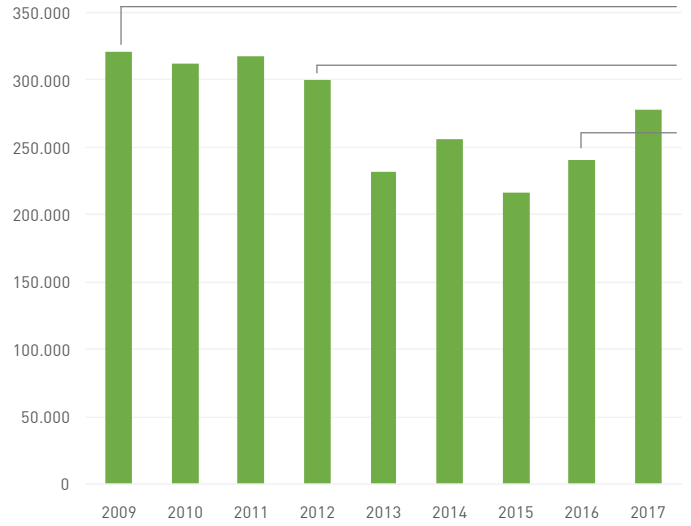
Exhibit 35 | Air Traffic in Naples-Rome (2009-2017).
Pax



April 2012: competition between NTV and Trenitalia begins.

Source: own analysis with data from ENAC and others.

Exhibit 36 | Air Traffic in Naples-Turin (2009-2017).
Pax



December 2008: the Naples-Turin HSL is now fully completed.

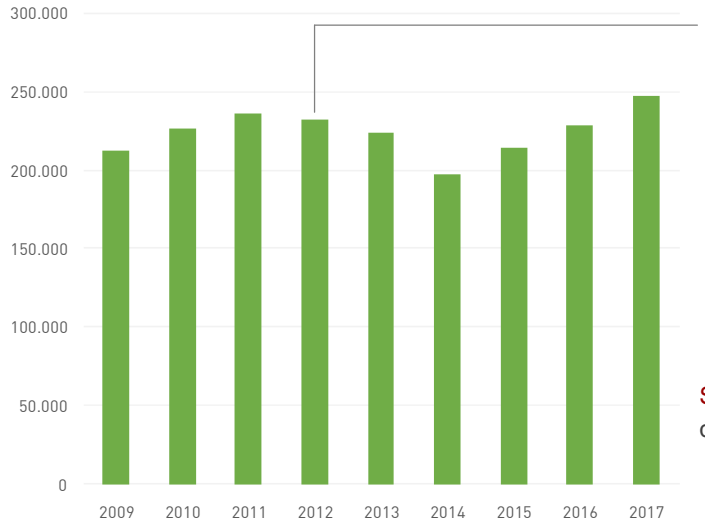
December 2012: competition between NTV and Trenitalia begins.

October 2016: Blue Air launches daily Naples-Turin flights.

Source: own analysis with data from ENAC and others.

Exhibit 37 | Air Traffic in Rome-Florence (2009-2017).

Pax

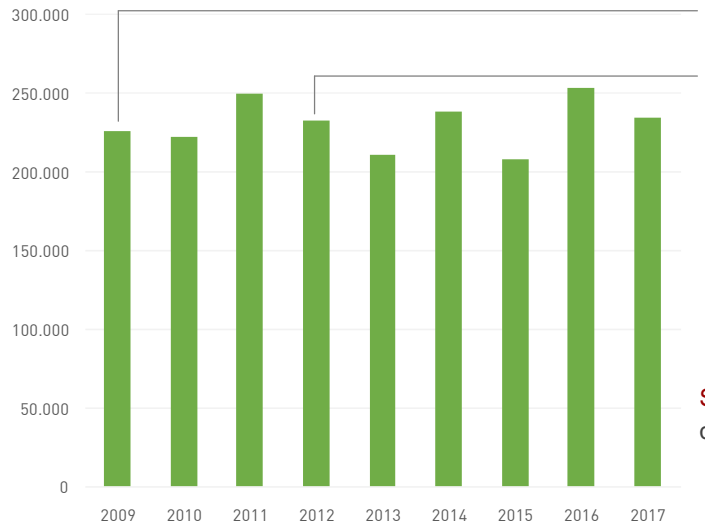


April 2012: competition between NTV and Trenitalia begins.

Source: own analysis with data from ENAC and others.

Exhibit 38 | Air Traffic in Rome-Bologna (2009-2017).

Pax



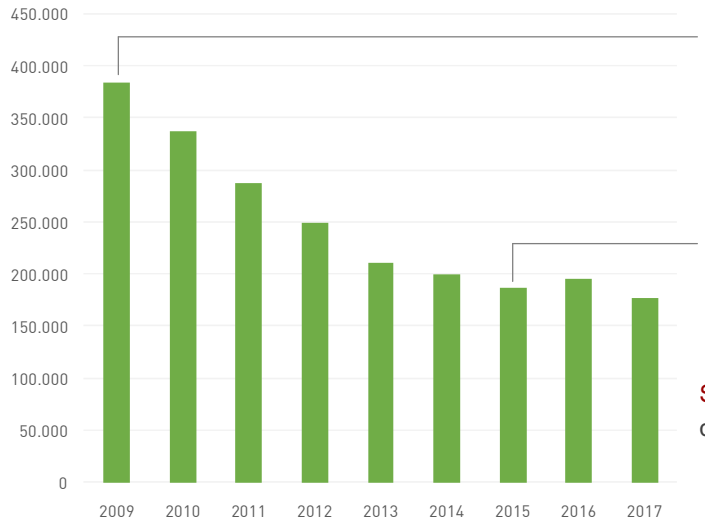
March 2009: the Rome-Bologna HSL is now fully completed.

April 2012: competition between NTV and Trenitalia begins.

Source: own analysis with data from ENAC and others.

Exhibit 39 | Air Traffic in Rome-Verona (2009-2017).

Pax

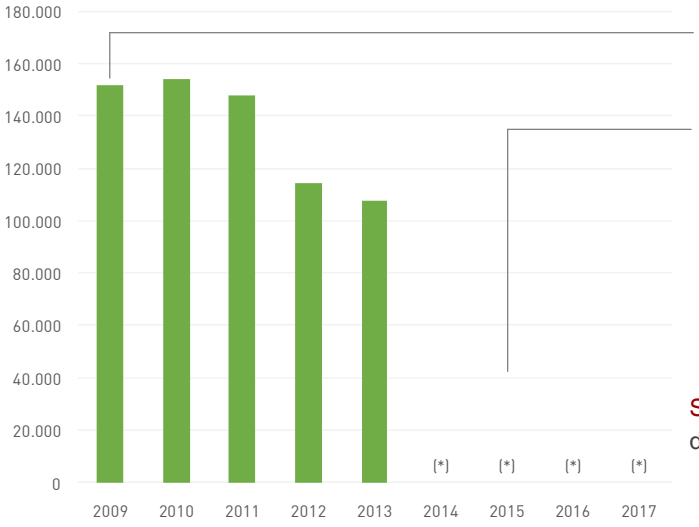


March 2009: the Rome-Bologna HSL is now fully completed.

December 2015: competition between NTV and Trenitalia begins.

Source: own analysis with data from ENAC and others.

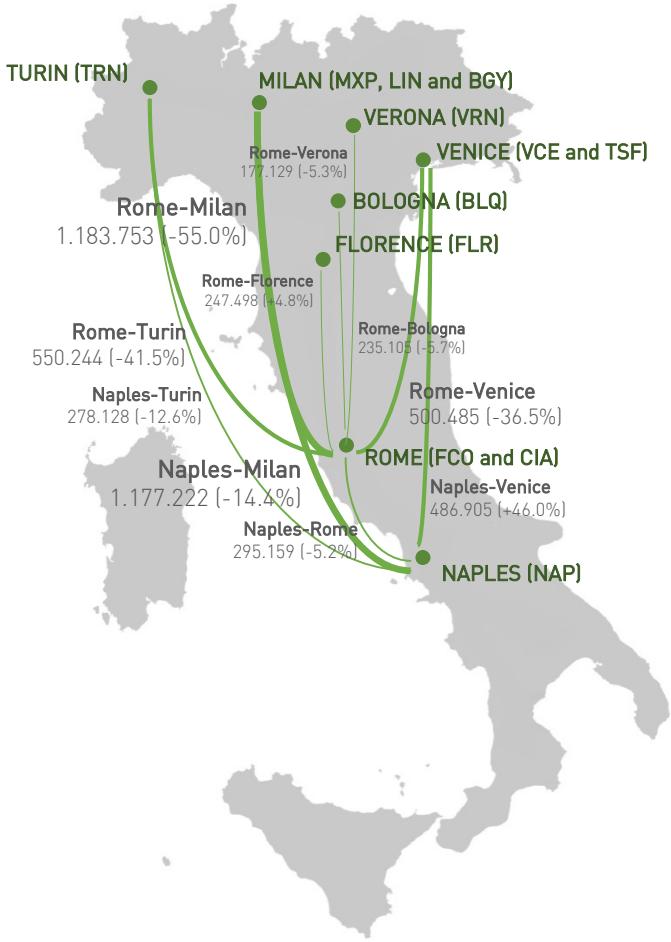
Exhibit 40 | Air Traffic in Naples-Verona (2009-2017).
Pax



Source: own analysis with data from ENAC and others.

Finally, air traffic in 2017 in the links listed above is summarized below (Exhibit 41).

Exhibit 41 | Air Traffic in Domestic Links with HSR Service in Competition (2017).
Pax and variation from the year before the beginning of competition.



Source: own analysis with data from ENAC.

Based on the traffic in 2017 and the variation from the beginning of competition, the links analysed can be grouped in three differentiated classes:

- **Class 1: Rome-Milan, Naples-Milan, Rome-Turin and Rome-Venice.**
  The busiest links have the most competitive HSR service in terms of travel time and have seen a strong decrease in air traffic. The Naples-Milan link presents a more limited decrease due to the recent entry of a low-cost carrier in the route. There is an important dependency on feeding traffic, which HSR is generally unable to capture (mainly due to the lack of presence at airports).

- **Class 2: Naples-Venice, Naples-Turin, Rome-Verona and Naples-Verona.**
  Minor and often longer links have seen a moderate decrease in air traffic or even a significant increase in the case of Naples-Venice due to the recent entry of a low-cost carrier in the route. HSR service is generally less competitive in terms of travel time, especially in the cases of Naples-Turin and Naples-Venice (both above 5 hours).

- **Class 3: Naples-Rome, Rome-Florence and Rome-Bologna.**
  Minor and shorter air links with a strong dependency on feeding traffic (not captured by HSR for the same reason as class 1 routes) present variations that do not depend on HSR competition since in these cases point-to-point travel by air is broadly uncompetitive and it is mainly funnelled by HSR. Therefore, fluctuations of air traffic in these routes are out of the scope of this document.

Regarding the evolution of class 1 routes, it can be appreciated that the Rome-Milan and Rome-Venice links have been strongly influenced by both the completion of the HSL and the new HSR competition regime, hence it can be assumed that their competitive travel times (under 4 hours) played an important role in their traffic decline. On the other hand, air traffic in other links such as Naples-Milan and Rome-Turin were not actually affected by the completion of the HSL since their traffic even increased. However, by contrast, their traffics started to decrease with the beginning of HSR competition.

With respect to class 2 routes, the Naples-Venice and Naples-Turin links were limitedly affected by the completion of HSL. However, HSR competition has had a positive effect on shifting passengers from air to train despite their less competitive travel times. On the other hand, the Rome-Verona and Naples-Verona links have seen a significant decrease in traffic since the completion of the Rome-Bologna HSL but the effects of HSR competition are still not very appreciable due to its more recent start in December 2015.

Furthermore, the transfer of traffic flows from air to rail transport has evidenced the potential to free up capacity at congested airports, which can be intended for growth in markets other than domestic ones, served by HSR. This is the case of Easyjet, which after terminating the Fiumicino-Linate route in 2015 took advantage of their valued slots at the saturated Linate airport and launched new frequencies to Amsterdam, London and Paris.

In conclusion, low-cost airlines have often proved to be unsuccessful in coping with the strong competition regime of HSR. Nevertheless, low-cost airlines have demonstrated to be

able to find opportunities to generate new demand and settle in the market, fundamentally in those links where HSR is less competitive in terms of travel time.

Nonetheless, despite the generalized decline of traffic in inland domestic air links, Alitalia resumed the link Rome Fiumicino-Milan Malpensa in April 2018 with four daily round trips aimed at targeting feeding traffic and both Easyjet and Volotea plan to launch daily round trips Naples-Turin in September and October 2018 respectively.

7.3 Impact on the Quality of the High-Speed Rail Service

The outcomes of the competition regarding user benefits cover a wide range of items. It should be noted that both operators offer the exact same travel times (at least for now) and hence the competition is focused on the quality of services.

Firstly, users benefited from a strong growth in the overall HSR services supply, which means from a practical point of view a high frequency of services and a wide range of schedules.

Users have also benefited from the widening of HSR services coverage especially in major cities such as Rome and Milan due to the fact that Italo initially operated from secondary stations in both cities, which despite the company later focused on central stations (Rome Termini and Milan Central), they have remained as complementary stops where most of their services call, and even Trenitalia has added to Frecce train services a number stops at these stations (Rome Tiburtina, Milan Porta Garibaldi and Milan Rogoredo).

Positive effects have been seen in the ancillary services as well, such as the introduction of free Wi-Fi, on-board entertainment, door-to-door luggage and local access and egress transport (car renting, parking reservation, local public transport ticket integration…). Furthermore, the launch of the Italobus network by Italo in 2015 prompted Trenitalia to launch Freccialink a few months later, which is roughly the same style of service intended to bring certain destinations closer to the HSR network.

The competition in the HSR had also a direct impact on the on-board levels of service and on the fare structure. From a simple base tariff with 1st and 2nd class, the service in Frecciarossa trains was restructured in 2011 with four levels of service (Executive, Business, Premium and Standard) and a new pricing structure with three different fares (Base, Economy and Super Economy) for each class. Thus, the provision of a wide-range of offers for all segments of users was made possible. NTV launched its train services in the following year with a similar structure of levels of service and fares.

Given that Trenitalia has been forced to adjust their offer and earn less where there is competition, some authors have suggested that the incumbent has been forced to charge users more where there is none, which is bad news for these routes.

Finally, it gives the impression that competition also prompted Trenitalia to put forward the commission the Frecciarossa 1000 fleet of brand-new high-speed trains, which became the flagship of the company and are currently the most modern trains in its fleet. It seems reasonable to think that Trenitalia would not have rushed to put forward so many upgrades in their service without the pressure of competition.

7.4 Barriers to Entry and Risk of Non-Cooperative Behaviour of the Incumbent

The rail industry is characterized by many barriers to entry, namely fair access to existing network infrastructure, terminals, depots, maintenance facilities and retail areas, owned by RFI (Desmaris, 2016).

It is suggested that NTV had to face barriers to entry and the risk on non-cooperative behaviour of the incumbent Trenitalia. For instance, it took one year for NTV to obtain the railway license and even longer to obtain the authorization from ANSF to operate the new trains after three years of assessment, which was perceived by the company as an excessive long time and as a barrier to entry to the market.

On the other hand, the company did not initially operate services to central stations in Milan and Rome and they lacked ticket machines in a number of train stations. However, there are no actual proofs that these issues were due to a supposed unfair behaviour of the incumbent. But there are other instances that were actually subject of public controversy that have already been reviewed throughout this document, such as the fence that RFI put in front of Casa Italo at Rome Ostiense train station or the platform height issues at Rimini train station.

In June 2013, the Italian antitrust authority launched an investigation into FS and its subsidiaries following allegations by NTV that the national company engaged in anticompetitive practices against them. NTV alleged that they had been the victim of a deliberate strategy of exclusion by FS, including limiting access to infrastructure (rejection to grant access to the depots of the incumbent, inability to secure train slots at certain hours…) and selling tickets at below cost price (Chiandoni, 2013). These events suggest that the regulations intended to ensure fair competition between operators are not enough to manage properly all aspects of competition (Giuricin, 2017). The Italian antitrust authority found no evidence of abuse of the FS dominant position following NTV appeals.

Besides, the Italian rail regulator was only made truly independent from government through the creation of ART (Transport Regulation Authority) on 17th September 2013, becoming operational on 15th January 2014.

The competition stage seems to be now in a much more stable position after Italo has overcome a number of obstacles and both the new entrant and the incumbent have benefited commercially and financially from the new situation. Nevertheless, there are still some pending issues, such as the lack of vertical separation between the public operator and the infrastructure manager (which can result in further problems for new entrants), the risk of cross-subsidisation in the incumbent or the lack of competition at regional level.

Clearly, it is difficult to compete with such a large former monopoly capitalized with public money (Stefanato, 2014). Some authors suggest that Italo has probably underestimated Trenitalia's ability to adapt its services, pricing and operational costs to respond to competitive pressures (Desmaris, 2016).

Finally, it is also worth remarking that regulation to guarantee the stability of the operators in the market is a very important element for the business. For instance, track access charges and energy costs should remain stable, since regulatory instabilities could affect users with increases in ticket price (Giuricin, 2017).

8

The Launch of a Competitor in the Spanish High-Speed Rail Network

8.1 Introduction

The purpose of this chapter is to provide some pieces of advice on the launch of operations of a hypothetical private open-access train company intended for the supply of a HSR passenger transport service in the Spanish HSR network in competition with the incumbent, state-owned company Renfe, based on the experience in the competition in the Italian HSR network already synthesized in the present dissertation.

The application in other countries of the lessons learned should be made with caution taking in mind the specific factors of the Italian case. Nonetheless, a number of meaningful guidelines on the configuration of a rail competitor can be stated in order to contribute to a better practice in other countries and in Spain in particular.

8.2 Overview on the Deregulation of Rail Transport in Spain

Since the last decades, the Spanish railway system has undergone a deep organizational realignment towards the future setting of rail transport in the European Union.

The First Railway Package (amendment of the EU Directive 91/440) was implemented in Spain through the Railway Sector Law 39/2003, which established the creation of two new public companies by January 2005: ADIF and Renfe Operadora, the rail infrastructure manager and the freight and passenger rail service operator respectively.

In 2013, Renfe Operadora was split into four commercial societies: passengers, freight, manufacturing and maintenance, and rolling stock leasing. The latter is intended to favour the opening to competition in both freight and passenger rail transport. On the other hand, ADIF was split into two differentiated public entities: ADIF and ADIF-Alta Velocidad. The first of them would keep its responsibility on the conventional network whereas the second would be in charge of the HSR network.

The CNMC regulatory organ is currently in charge of the supervision and control of the correct functioning of the rail sector (among other markets and sectors) and, among a number of other particular functions, it is responsible for ensuring fair competition in this sector.

With regards to the requirements for access to the RFIG entrants must comply with the provisions of the Railway Sector Law that include, amongst the most relevant requisites, to have a Railway Company License, a Security Certificate and the allocation of the needed infrastructure capacity. Additionally, homologated rolling stock (own or leased) and staff are logically necessary.

According to the market pillar of the Fourth Railway Package, full liberalisation of passenger rail transport (affecting all lines and a priori without limit of operators) will be compulsorily implemented as of January 2019, whereas the train service will be effective with the start of the winter timetable in December 2020.

8.3 Introduction to the Spanish Framework

In order to better adjust the guidelines on the setting-up of the competitor to the Spanish railway framework, it is necessary to review a number of inherent items that represent significant differences with the Italian framework, which has already been extensively inspected.

8.3.1 Network Geography

The current Spanish HSR network is near 3.000 kilometres long, radial-shaped, and links most of the main cities in the country (Exhibit 42). However, the Spanish population density is less than half that of Italy and it is irregularly distributed over the inland territory and concentrated in a few areas (nearly 65% of the inland population live near the coast and another 15% lives in the Madrid region) whereas its area is nearly 65% greater.

As a result, from a territorial coverage point of view, it has been necessary to build an extensive network in order to reach all the major urban nuclei, often through extensive low-populated areas in contrast to Italy, where many of the major cities served are separated by distances ranging from 150 to 250 kilometres, which is very favourable for HSR competitiveness.

Exhibit 42 | The Spanish HSR Network in 2018.

Source: ADIF.

8.3.2 Technical Perspective of the Spanish HSR Network

The Spanish HSR network adopted the technical specifications of interoperability of the European Union. Specifically, the network adopted the UIC track gauge, it is equipped with the ERTMS signalling system (N1 and N2) and it is electrified at 25 kV AC. However, the Madrid-Seville HSL, built in an earlier stage, is fitted with the LZB signalling system instead. The overall network is designed exclusively for passenger traffic. In fact, the load per axis is limited to 17 tons (compared to 25 tons in the Italian AV-AC system) and slopes are generally greater than the maximum allowed for freight. According to the Capacity Manual, the actual average capacity use is 4 to 5 trains per hour in each direction, far from the maximum theoretical capacity of 24 trains per hours in each direction.

The network is generally designed for a maximum speed of 350 km/h. Nevertheless, the current maximum operating speed is limited to 300 km/h, except for a section of the Madrid-Barcelona HSL, which allows a maximum speed of 310 km/h to some trains.

A very relevant trait of the Spanish HSR network is the fact that it is mostly independent from the conventional rail network due to the different track gauge adopted. This is a very positive point in terms of service reliability of the network since it is much less dependent on the incidents that take place in the conventional network. The very high punctuality rate of Renfe HSR services clearly reflects this fact when compared with HSR services from other networks. In any case, the variable gauge trains by Talgo and CAF are technically capable of operating in both the conventional and the HSR network by travelling through a break of gauge.

Another consequence of the aforementioned point is that there is not much room to be innovative when it comes to the selection the train stations where to operate in each city served, since all trains are physically confined to the HSR network that gives direct access to selected stations where the incumbent operator already operates.

Nevertheless, as a curiosity, the Spanish Government announced in February 2018 that the El Prat de Llobregat train station (8 kilometres south of Barcelona’s central train station through the Madrid-Barcelona HSL) would be adapted to serve as a secondary station for HSR services in the Barcelona area, specifically for the new Renfe’s EVA low-cost HSR services. Therefore, this station will become the first alternative to a central station within the Spanish HSR network.

On the other hand, another positive aspect of the network in terms of efficiency is that there are no terminal stations in the cities served along each line (except at the ends of the lines) and hence there is no need to turn around at any point of the network during a journey.

Finally, it is worth noting that airport HSR connections in Spain are non-existent and it can be assumed that they will not be available in the near future.

8.3.3 The Long-Distance Passenger Transport Market

The size of the HSR market in Spain in terms of ridership and RPK can be obtained by adding the traffics of Renfe's AVE, Avant, Alvia and Altaria HSR services (brand names of differentiated services), obtaining near 36.5 million passengers and 14.082 RPK in 2016 (Observatorio del Ferrocarril en España, 2016). The overall traffic has seen a sustained substantial growth over the last few years as a result of the progressive expansion of the network and hence of the HSR services, the new commercial policy adopted by Renfe in 2013 and the economic recovery. Therefore, it is expected that this trend will go on in the upcoming years.

Despite the considerable extension of the Spanish HSR network, the current domestic inland air passenger transport is still significant among many of the links with HSR service. A clear example is the Madrid-Barcelona link, which has the greatest demand in the country since in 2017 (9 years after the full completion of the HSL between both cities) there were still 2.34 million passengers who travelled by air (part of which is Iberia's and Air Europa's feeding traffic), whereas Renfe's AVE reached a 61.1% of the air-train modal split in the route (Renfe and Aena, 2017). This example suggests that there is still considerable room for growth of the HSR traffic, or in other words, there is room for improvement in efficiency, commercial policy and innovation among other elements. Let us address so in a different way: it can be seen as a matter of creativity.

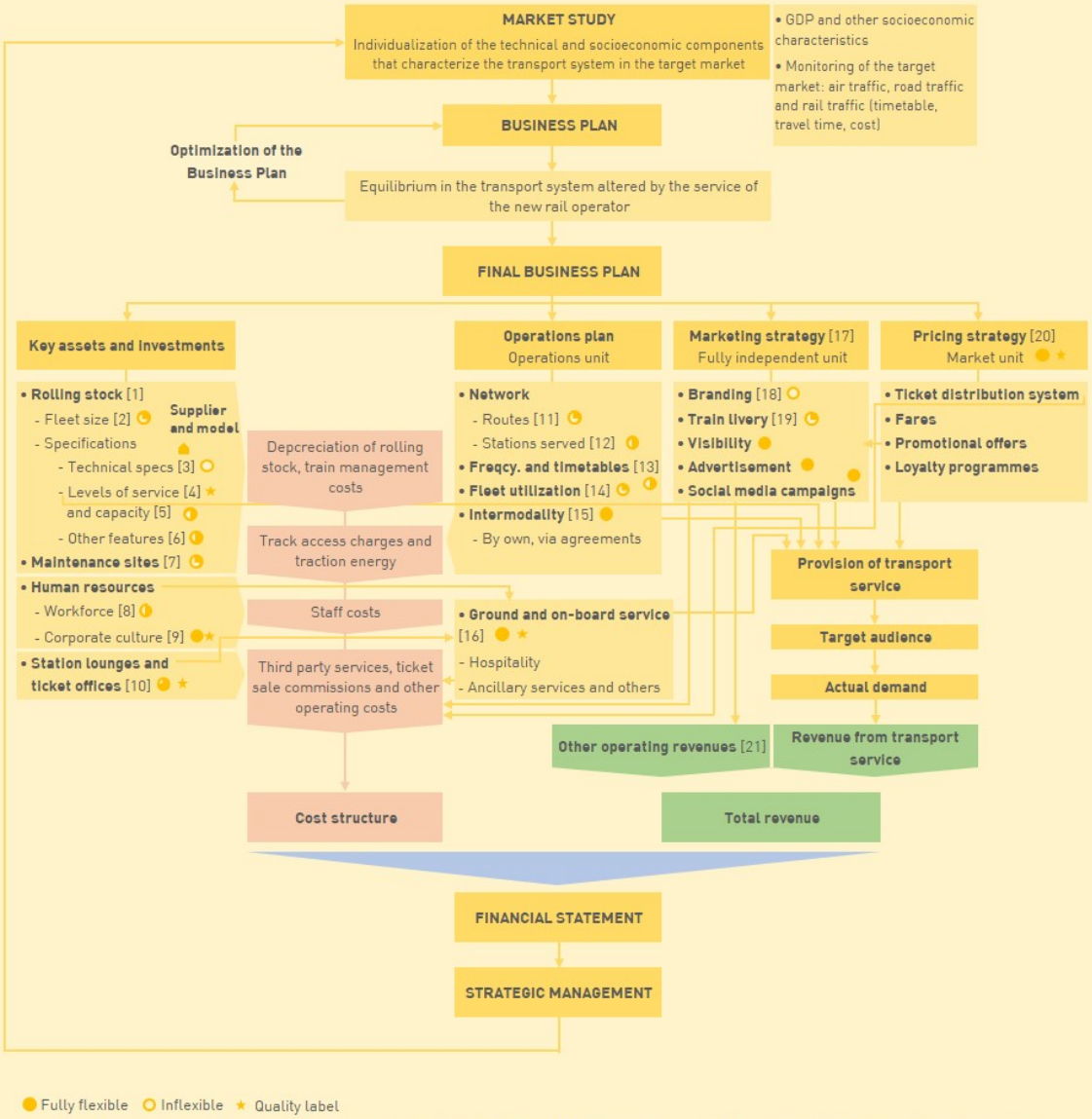
8.4 An Approach to the Setting-up of a New HSR Competitor

A procedure has been elaborated to guide the start-up of a new HSR competitor comparable in terms of product to Renfe's AVE, Italo or any other European traditional HSR service. This procedure covers comprehensively all points previously identified as key to success, in terms of key assets and investments, operations, marketing, pricing strategy and ground and on-board service, and the interactions between them and with each cost and revenue component, as shown in the exhibit below (Exhibit 43). Additionally, a degree of flexibility is assigned to most of the components within the chart with the purpose of better indicating the approach required for each of them, as well as a quality label aimed at highlighting the opportunities for the company to outstand especially in terms of product quality.

The goal of these points is to enable the new operator to achieve a lower CASK than the competitor's while providing a competitive and appealing service for users. In fact, most of them are required by the Spanish administration to be defined in the business plan of future tenders. Due to the nature of these guidelines, the procedure presented below is not only applicable to competition regimes, but also for any train company operating in the field of HSR in monopoly that seeks for the aforementioned goals.

Firstly, it is essential to carry out a market study in order to gather the appropriate data, i.e. basically the technical and socioeconomic components that characterize the transport system in the target market, which will allow quantifying the variables of the problem. Then, the business plan is carried out based on the results obtained through an iterative process that guarantees the future equilibrium of the transport system after introducing the new supply of train services. The guidelines presented in the exhibit and explained below have to be appropriately applied according to the results of this process.

Exhibit 43 | Outline for the Setting Up of a HSR Operation.



Degree of flexibility based on the possibility to make adjustments in the item after having been set in the first business plan in terms of time and resources.
Quality label refers to those key items by which the company can make the service outstand.

Source: own analysis.

[1] Rolling stock. There are basically two ways by which the new entrant can gain access to rolling stock: by purchasing brand-new trains or by resorting to leasing. The latter is very limited due to the fact that there are only a very few ROSCOs, which is explained by the inherent property of rail transport related to limited interoperability of networks, and that in the Spanish case there is no surplus of HSTs. Therefore, the new company will have to commission its own fleet of new trains, which entails a large up-front investment and consequently a considerable risk. It is clear hence that the railway sector is capital intensive, which results in a strong barrier to the entry of competitors.

[2] Fleet size. It is important to note that incumbent companies, by operating in all passenger and freight markets, benefit from large and positive economies of scale and scope, which represent a substantial economic advantage over smaller companies such as new entrants. Therefore, it is highly recommended to the new company to venture to launch their operations with a considerable initial fleet size in order to benefit from a more competitive unitary purchase cost (with respect to having started operations with a smaller fleet), but always according the well-defined business plan.

Low degree of flexibility. As a fixed asset requiring a high investment, it must be carefully assessed in the very first planning of the company in a long-term view, with the aggravating inherent constraints of the rail industry such as the lack of a single European railway market and the lack of a market of used rolling stock that makes the investment even more risky. In later stages, in accordance with the business development and market studies, the company can consider to expand the fleet of trains. The delivery of new trains can take about two years from the signing of the contract.

[3] Technical specifications. The fleet of trains will have to meet the aforementioned requirements to operate in the Spanish HSR network, namely the track gauge (fixed), the loading gauge, the electric systems, signalling and security systems. Furthermore, a maximum operating speed of 300 km/h is required to compete directly with Renfe's AVE and to ensure high operation efficiency (in terms of average mileage). A number of HST platforms that can meet the conditions pointed out properly are currently available in the market, such as Talgo's Avril, CAF's Oaris, Alstom's Euroduplex, Avelia and AGV, Siemens Velaro and ICE 4, or Hitachi's ETR 1000.

Very low degree of flexibility. Technical specifications cannot be substantially modified. Nevertheless, changes that may propitiate the need to do so are highly unlikely.

[4] Levels of service. The optimal configuration of levels of service within the fleet has to be defined based on market studies that determine the business plan and hence the target audience. The common scheme adopted among most operators in HSR has two levels of service (First and Second class), but there are some exceptions such as Renfe's AVE or the Austrian and Czech Railjet, which adopted a 3-class scheme, whereas in Italy both Italo and Frecciarossa have a 4-class scheme.

Intermediate degree of flexibility. Adjustments of the seat layout (for instance increase seats in one class at expenses of seats in another class) can be made in a short time span with a relatively low investment, based on the business plan updates in a medium-term view. However, it is worth considering the option to introduce a greater

degree of flexibility in the layout by making possible to easily adapt services in order to better meet demand in a very short time (from one train service to the immediately following, similarly to what Italo did with Comfort and Prima classes), which requires a very flexible and integrated IT architecture. This is especially relevant when it comes to the routes operated (business heavy links vs. leisure-oriented links) or the time of the year (fluctuations in the peak season in summer or other holidays).

[5] Capacity. It is highly advised to attempt to provide a similar or higher seating capacity on the fleet than the competitor since capacity is inversely proportional to CASK. However, this has to be set in accordance with the established levels of service, passenger comfort standards and obviously within the physical limits of the train and fulfilling the safety conditions.

Intermediate degree of flexibility. In general, train capacity can only be modified by means of the medium-term adjustments mentioned in the previous point, which consists in varying the weight of the levels of service (since each one of these have different seating densities).

[6] Other features. The company can consider other ways to manage the available space on each car. For instance, the traditional on-board bar-restaurant can be ruled out in favour of vending machines and galleys, enabling the company to free up valuable space for more seats. In these cases, rest rooms can be added in order to offset the lack of bar standing areas for passengers. In some cases, a few arrangements in the train design can make it possible to add space for further seats.

Intermediate degree of flexibility. Adjustments in these features belong to the same sort of adjustments in the seat layout already explained. Therefore, they can be made in a short time span with a relatively low investment, based on the business plan updates in a medium-term view.

[7] Maintenance sites. The company may be granted access to existing maintenance sites (in a context of cooperative behaviour of the incumbent and hence fair competition) or it may have to establish its own maintenance plant. In any case, since maintenance is generally carried out overnight, these plants ought to be located as close as possible to the main network hubs (at the ends of the lines), where trains stay overnight. Furthermore, since it is assumed that trains stay at both ends of a line, it is convenient to have plants at both ends so that maintenance schedules can be flexible and hence they can be carried out efficiently. Last but not least, outsourcing is an opportunity to adjust train maintenance costs.

Low degree of flexibility. The availability of maintenance sites provided by the incumbent depends on their capacity and the predisposition of the incumbent to grant access. On the other hand, own maintenance plants may require a significant investment. Therefore, the flexibility of this factor depends on the solution adopted and it is rather low in general, since shared maintenance sites may be a more inexpensive solution but it would be out of control of the new entrant by contrast to own plants, which is a long-term investment.

[8] Workforce. The company ought to forecast the required workforce for the different tasks of the business: on-board and on ground crew (train drivers, conductors, train attendants, lounge attendants…), office staff, outsourced staff, officers, managers, etc. Besides, work shifts, wages, working conditions, specific tasks and relationship between unions have to be defined as well. Experience shows that more variable working hours per day (with the same weekly working hours) favour more efficient planning of schedules by allowing a better match between shifts and trips. On the other hand, there is some room for innovation when it comes to remuneration systems.

Intermediate degree of flexibility. Since most of the aforementioned parameters are always subject to union approvals, the possibilities of modifying labour agreements are deemed to be limited to some extent.

[9] Corporate culture. The company should shape a broad corporate culture covering a wide range of traits such as the dress code, employee benefits, hiring decisions, treatment of clients and other operation aspects, since these factors contribute significantly in setting a distinctive product in the market.

Fully flexible. Corporate culture can be considered an intangible asset and often develops organically over time from the cumulative traits, but in any case, it is not a matter of investment and can be appropriately redefined or enhanced at any time.

[10] Station lounges and ticket offices. These assets are key to the visibility of the company in train stations and have direct implications on ground services for passengers. Therefore, it can be distinctive of the company and part of the marketing strategy.

High degree of flexibility. The introduction of station lounges and ticket offices depends on the allocation of appropriate spaces in train stations where the company is willing to operate by the incumbent and require low investments.

[11] Routes. As it has been discussed previously in Section 3, all competing private companies operating in the long-distance passenger rail transport market in Europe have focused in the domestic routes with the highest demand (which are usually those that have the best technical performances). Indeed, the plans of the Spanish government towards the liberalisation of the HSR network have always referred to the lines with the highest traffic as well. Therefore, it seems reasonable that the hypothetical company should focus on these corridors, namely the north-eastern corridor (Madrid-Zaragoza-Barcelona-French border), the eastern corridor (Madrid-Valencia/Alicante/Murcia) and the southern corridor (Madrid-Córdoba-Seville/Malaga). Operation beyond the HSR network is not advisable due to the lower reliability of the conventional network and the need of specific rolling stock with variable gauge.

Low degree of flexibility. As explained above, room for creativity regarding the routes operated within the HSR network is limited by the network physical limits. Furthermore, the selection of a certain route to operate is a long-term decision involving the introduction of such a product in a market that was previously monopolistic, requiring an undefined period to settle in the market. On the other hand, the withdrawal of a trunk route in a short or medium term should be avoided since it could damage a brand that is still settling.

However, minor routes are generally more flexible to be implemented and to be dropped whenever the company decides to do so. With regards to network expansion, unless substantial adjustments are planned with current resources, it may require an expansion of the fleet, which as mentioned previously is a long-term high investment. Subsequently, the process of introduction of the service in a new market will have to be repeated.

[12] Stations served. As mentioned previously, the range of stations where a HSR operator may choose to operate is limited by the network limits. Within the options available, the stations at which the company will operate and the number of stops of each of their services will have to be specified based on the business plan.

Intermediate degree of flexibility. The presence of the operator in a certain station is a key market factor, similarly to the routes operated, and hence it is rather rigid. However, with regards to the intermediate stops of each train service, there is a much greater room for adjustments either to add or to drop calls at train stations along the way.

[13] Frequency and timetables. There is a direct relationship between frequency and timetables since both factors determine the production of train-km, which is subject to the fleet size. It is important to understand that in order to stay competitive against Renfe's AVE, the entrant must provide a comparable service in terms of frequency (and hence in terms of daily round trips) and therefore an intensive supply of trains is required. Furthermore, in order to capture business travellers, the cadence of trains in busy routes should be at least 1 hour in each direction, which can be stepped-up in rush hour. In less busy routes, the frequency can be lowered to 2 hours. With regards to timetables, schedules are granted by the infrastructure manager based on available slots on the line whereas travel times are based on the performances of the infrastructure (collected in the statement of the network). The operator may request the slots that best fit with their operations plan. Assuming that timetables are subject to fixed cadences and not to the maximization of rotation schedules (operational times of each service), some sorts of inefficiency in turn around times may arise, which have to be carefully assessed.

Intermediate degree of flexibility. The adjustment of frequency and timetables is subject to the capacity of the infrastructure concerned and to the infrastructure manager approval. Additionally, it is clear that the operator's ability to substantially modify the supply of trains (i.e. the production of train-km) depends directly on the fleet size (assuming that operations are already optimized to some extent) and hence it is a rather rigid factor. However, schedule modifications with the resources at the time are feasible.

[14] Fleet utilization. There is a direct relationship between the fleet utilization, frequencies and timetables since the first factor defines the quantitative possibilities of schedules. The availability of the trains should allow an operation schedule ensuring an average production of train-km per unit train between 550.000 and 600.000 kilometres per year.

Low degree of flexibility. The optimization of the fleet utilization is mainly driven by the maintenance cycles and the efficiency of schedules. The first depends on the responsible of the train maintenance and it can be assumed that it can be optimized to some extent, whereas the second strongly depends on dwell times, which ought to be minimized when

possible in correspondence with schedules. Nevertheless there is very little room for improvement beyond these basic adjustments. In any case, it is highly advised to maximize the fleet utilization since it is inversely proportional to CASK. Experience shows that it is reasonable to achieve a production of train-km per unit train of 600.000 kilometres per year with the appropriate operational adjustments.

[15] Intermodality. Various models of intermodal transport involving the new train service can be implemented, such as agreements to provide integrated tickets with local transport companies to ease mobility within major cities or bus companies to reach destinations not served directly by their HST services. Additionally, other arrangements for car rental or to take a taxi would be ideal.

Fully flexible. Despite these sort of activities often involve agreements with third parties, it can be assumed that they are very flexible and often require very low investments and hence they can be adjusted or improved relatively frequently.

[16] Ground and on-board service. There are a number of factors that define the ground and on-board services to passengers, which is related to the corporate culture and contribute significantly to the distinction of the train service. With regards to the ground service, it involves mainly the train station hospitality by the train crew on the platform (fast track train access and reception) and in the station lounge and its facilities (for instance Wi-Fi, a relax area with comfortable seating, newspapers and magazines, catering, real-time information on the train service, etc.). With regards to on-board service, this is defined similarly to the ground service as already commented and according to the levels of service.

Fully flexible. In general, it can be assumed that these factors require low investments and are very flexible despite the fact that ground services are subject to agreements with the infrastructure manager for the use of public space in train stations for lounges, ticket vending machines and fast track train access.

[17] Marketing strategy. This factor is responsibility of a fully independent unit that can carry out a wide range of actions to promote the new train service, such as television advertisement, engagement in a social media public awareness campaign, increase visibility in train stations through lounges and ticket offices, etc. Also, it is a good idea to focus on special events to hook new customers and retain them (the MWC, as an example).

Fully flexible. The sort of activities within this unit can be implemented at any time and entail low investments.

[18] Branding. Brand management should be taken as an exception within the market strategy and the aforementioned marketing actions since the brand has to be defined from the very beginning and functions as an umbrella for the entire subsequent marketing strategy. It is deemed essential in order to introduce a distinctive service in this market.

Very low degree of flexibility. Once the brand of the new train service is defined, considering that it always takes some time to settle in the market and taking into account its

long-term relevance from a marketing point of view, it can be assumed that it becomes inflexible for a long time and only minor arrangements that do not alter its essence can be considered realistic.

[19] Train livery. Closely related to branding, it is one of the most visible factors of the product since it acts as an identifier of the company's trains for all of their passengers an even for those that are not theirs but who may notice their trains at stations. It has to be defined from the beginning as well and it is often defined together with the brand.

Low degree of flexibility. While brands are usually maintained unaltered, liveries may be updated in the long term, which roughly speaking means above 20 years since its inception.

[20] Pricing strategy. This strategy is fundamentally based on the yield management system, which allows maximizing revenue by segmenting the offer and providing low ticket prices for low demand periods or with change restrictions, which makes the service accessible to price-sensitive users, and maximizing yields from those that are less price-sensitive or that privilege flexibility in timetables. Therefore, a range of fares in each level of service as a function of the allowance to make changes in the ticket is required. On the other hand, the set up of a programme intended for customer loyalty is also a required element and promotional offers play an important role in the marketing strategy. Last but not least, it must be taken into account the importance of the ticket distribution system, since there is room for cost adjustments in commissions and fees by adopting a particularly digital system and outsourcing some of the linked activities, similar to those adopted by low-cost airlines.

Fully flexible. The definition of the pricing strategy requires a low investment and it can be adjusted at any time (with the pertinent assessment) with immediate effects. This is responsibility of the market unit, which can be assumed to be an independent unit.

[21] Other operating revenues. The company can expect to have other incomes apart from those of ticket sales and the transport service in general, such as from white certificates (provided that the company is included in a White Certificates programme) and from royalties and advertising spaces. These incomes can represent approximately up to 10% of the revenue from transport service.

Intermediate degree of flexibility. EECs can be considered as long as they have been implemented in the country, whereas incomes from marketing depend directly on the activity of this unit of the company.

9

Conclusions

9.1 Conclusions on the Features of the Italian High-Speed Rail Network

1) The favourable economic and demographic conditions for HSR. The economic and demographic characteristics of Italy are very favourable for HSR since it allows serving a large population efficiently from a network coverage and competitiveness point of view.

2) The non-optimal preliminary layout of rail infrastructures towards a fully integrated HSR network throughout the country. A number of hub train stations in the network are terminus, which results in some inconveniences for the operation of through train services since travelling through slow approaches to stations and turnarounds are required and hence travel times are slightly penalized (in a sector in which travel time matters). Nonetheless, solutions such as the reconfiguration of some route patters or new urban rail links have been adopted or are currently being adopted with the aim to sort out these issues.

3) The infeasibility to take advantage of long-distance traffic flows to airports. The review of the possibilities to bring HSR to airports reveals that the current infrastructure limits its viability and that the geographical layout of the infrastructures concerned around major airports often makes so even more complicated. Nevertheless, long-term investments in new rail links could make it possible.

9.2 Conclusions on Italo's Experience

4) The favourable circumstances for rail competition and the entrepreneurial spirit of the newcomer. The fundamental conditions of Italo's success include preliminarily the role played by the Italian Government to promote rail competition and the pre-existence of a newly-built high performances HSR network covering a large part of the country. Subsequently, of great importance is the risk the company assumed by allocating near €1 billion Euros in the up-front investment, the development of an innovative business model and other circumstances out of the company's scope such as the reduction in track access charges.

5) The innovation in the rail transport industry. The Italian experience and especially Italo's business model has evidenced that there is room for innovation in the rail transport market despite the inherent constraints of the rail industry such as technical rigidities and market regulations, which make more difficult to differentiate a product from the competitor's. Some of the innovation instances identified include the levels of service, ancillary services, stations served, remuneration models for staff, ticket distribution systems, outsourcing activities, station lounges, intermodality through local bus feeding...).

6) The ability to respond to adverse economic circumstances. The first years of operation were extremely challenging for Italo since the deep economic crisis of 2008 was definitely unpredictable when the company was established in 2006, which hurt their financial forecasts. Nevertheless, the company proved to be able to react to these adverse circumstances by launching a turnaround plan in 2015 covering a wide range of operating activities, meant to overcome its very critical financial situation. The positive commercial and financial results later achieved proved the validity of the course of action implemented. Last but not least, it is important to highlight the capacity of Trenitalia to cope with the competitive pressure and to improve its services.

7) The importance of operations efficiency. In relation to the previous point, it is noteworthy that a key point of Italo's turnaround plan of 2015 was to use the fleet more intensively, and its outcomes evidenced that there was actually significant room for improvement in this aspect (the production of train.kms increased by 24% with the same fleet size) and hence some doubts arise on the company's early management decisions. This is of special relevance so as to achieve a CASK lower than the incumbent's (one of the main goals of the newcomer in order to become successful), since operating costs strongly depend on how companies use their most expensive assets –trains.

8) The implications of the company's size. The size of the entrant seems to play a very important role in determining its competitiveness since small-sized operators are prevented from benefiting from economies of scale, scope and density, and hence this has obvious implications in the overall cost structure. Therefore, the most convenient strategy appears to be the launch of operations with a considerable supply of services (i.e. the fleet size).

9) The positive effects of network reliability. The quality and the technical performances of the infrastructure appears to be key to encouraging competition since it allows operators to achieve a certain degree of robustness of their networks. In other words, a new entrant may be prone to assume low risks as much as possible in terms of reliability by confining to those high-performance lines (often HSLs) in order to achieve a certain competitive advantage over the incumbent. In fact, reliability has direct implications on required turnaround times at the end of a trip and hence on the maximum possible production of train.kms, and as a consequence on CASK.

9.3 Conclusions on the Impact of Rail Transport Competition in Italy

10) The potential of rail competition to reform the overall long-distance transport system. The experience of HSR competition in Italy and the resulting widespread fall of yields proved its capability to bring about a significant redistribution of traffic flows by diverting traffic flows from air, road and other rail services to HSR and to induce new demand.

11) HSR has overcome domestic inland air traffic. HSR has already conquered a considerable part of the Italian long-distance passenger transport market. The evolution of domestic inland air traffic since the completion of the backbone Turin-Milan-Rome-Naples-Salerno in 2009 shows that the completion of the this infrastructure brought a significant reduction in air traffic and that the new rail competition regime, started in 2012, has accentuated this tendency even more, which proves the effects of the overall reduction in ticket prices in HSR even in long links with less competitive HSR point-to-point travel time, which in some cases is above 5 hours.

12) The redistribution of transport infrastructure capacity. Rail competition results in a higher use of the infrastructure capacity provided by the HSR network, which is very positive taking into account the massive investments that this sort of infrastructures require. Furthermore, the shift of traffic flows from air to rail transport may have positive effects on congested airports by freeing up capacity that can be intended for growth in markets other than domestic ones served by HSR.

13) Benefits for users in the HSR market. Rail competition in Italy has been able to bring significant benefits in the long-distance transport market such as the possibility to choose carrier, the overall decrease in ticket prices, the increase in the overall supply of HSR services, the improvement in frequencies and in the quality of services and more differentiated levels of service.

14) Benefits for the overall long-distance transport system. Some authors have suggested that despite rail competition brings a reduction in ticket price for users, it is not clear that the overall cost of the transport system is actually reduced since the liberalisation may lead to a greater financial pressure on the system (Montero, 2016). For instance, in the Italian case, the reduction of track access charges effective from 2015 aimed at “the general interest” (La Repubblica, 2014) forced the infrastructure manager (i.e. the state) to assume a higher part of the cost of the system. Nevertheless, the increase in HSR traffic has allowed RFI to increase the overall track access charges revenue and hence to offset the cut in charges. Furthermore, the competition appears to be commercially and financially positive for both the incumbent, which has been pressed to improve its services and to adjust operational costs, and Italo, which is already in a sound financial footing. Therefore, in any case, a greater regulatory intervention with the aim to control the negative effects of competition should be taken into consideration by governments.

9.4 Conclusions on the Feasibility of Rail Transport Competition

15) The role of the Single European Railway Area. The technical inherent characteristics of rail transport still represent great obstacles towards a competitive rail market, which provides strong support to the Single European Railway Area (currently in process of implementation) that aims at overcoming these barriers. This is especially relevant in the

context of the liberalisation of rail transport, since the lack of ROSCOs and the limited interoperability of networks represent a significant barrier to the entry of new operators to the market and therefore it is more difficult for governments to promote rail competition.

16) The market size may limit the possibilities of efficient rail competition (I). The Spanish Report of the technical-scientific Commission for the study of improvements in the railway sector of June 2014 suggests that the liberalisation should be carried out gradually and regulated carefully in order to avoid economic difficulties and the lack of profitability of operators due to the limited market size. In fact, in the Italian case, it is not likely that a third company will join the HSR market due to the lack of room in terms of infrastructure capacity and especially its doubtful profitability since the market is currently governed by low yields. With regards to Spain, since traffic figures are lower, it can be assumed that the market is tighter in order to take on a new HSR operator and that only a few HSR lines have enough passenger traffic so that the introduction of competition is feasible from an overall economic point of view, understanding that competition in low traffic lines could lead to sorts of inefficiency and the deterioration of the service.

17) The market size may limit the possibilities of efficient rail competition (II). Similarly to what has been already stated, it could be difficult to introduce competition in the lines of the Spanish HSR network in which the new entrant would be unable to offer a supply of at least one train per hour in each direction likewise the incumbent (assuming it would be optimum from their business point of view) due to the market size. The newcomer could consider entering the market with a smaller supply of trains, but it has to be taken into account that other drawbacks may arise such as the lower benefit of economies of scale and density. Furthermore, these benefits are precisely what have made Italo's success possible, which is the only available experience of real competition in HSR. In conclusion, HSR competition in Spain is only likely to take place in the busiest routes, at least in a first stage.

18) Move on towards fair competition. The experience also backs up the importance of non-discriminatory access to the rail network (namely lines, slots, stations, maintenance facilities and others) in order to ensure fair competition, which could be ensured with a more independent network manager.

19) The applicability of the lessons learned. The application in other countries of the lessons learned should be made with caution taking in mind the specific factors of the Italian case, such as the different contexts, railway networks, economic and demographic characteristics, regulatory and antitrust institutions, etc. In this sense, the instruction manual stated in Section 8 must be employed with wise foresight. The guidelines included within it are also applicable for any train company operating in the field of HSR in monopoly.

9.5 What is Next?

The present dissertation can be seen as a necessary preliminary step to begin to mull over the entry to the market of HSR long-distance passenger transport in Spain with the aim to compete with the incumbent, state-owned operator Renfe. Therefore, the stated guidelines and conclusions of the thesis encourage going ahead with further research on the treated topics and beginning the process to project the setting up of a competitive private operator of HSR services.

The goal of the advent of the hypothetic company would be to reform the outlook of the overall long-distance transport system in Spain by introducing a considerable supply of services that would substantially modify the equilibrium of the system. Specifically, it is expected that the new hypothetic competition regime would be able to bring meaningful benefits for users including the improvement of rail transport competitiveness, the reduction in ticket prices and hence an increment in HSR traffic (and subsequently a reduction in air and road traffic), as well as to improve the quality of the overall long-distance rail transport services.

Besides, the regulatory intervention should endeavour to ensure that competition is fair, that it is efficiently carried out and that it is able to bring about a reduction of the overall cost of the transport system.

Altogether, this is what the process of liberalisation of rail transport carried out by the European Union has been persevering in over the last few decades. Finally, a successful rail competition could certainly help to promote HSR as a more efficient, sustainable and environment-friendly means of transport.

10

Appendix

Appendix 1 | Trenitalia High-Speed Rail Offer

1.1 Network

Trenitalia's HSR services network is presented below (Exhibit 44).

Exhibit 44 | Frecce Services Network.

Source: Trenitalia S.p.A. (Updated in April 2018).

1.2 Service List

The current Frecce HSR services are detailed below (Table 18).

Table 18 | List of Frecce HSR Services.

Route (from north to south and from east to west)	Category of service	Daily departures in each direction
Brescia/Turin-Milan-Reggio Emilia-Bologna-Florence-Rome-Naples-Salerno-Potenza-Taranto	Frecciarossa	53 [1]
Turin-Milan-Rome-Naples-Salerno (non-stop between Milan and Rome)	Frecciarossa	15 [2]
Udine-Venice-Padua-Bologna-Florence-Rome-Naples-Salerno	Frecciarossa	13 [3]
Trieste-/Udine-Treviso/-Venice-Padua-Vicenza-Verona-Brescia-Milan-Turin/Genoa	Frecciarossa	23 [4]
Milan-Reggio Emilia AV-Bologna-Rimini-Ancona-Pescara-Foggia-Bari	Frecciarossa	2 [5]
Trieste-Venice-Padua-Bologna-Florence-Rome-Fiumicino Airport	Frecciargento	7 [6]
Bergamo-Brescia-Verona-Bologna-Florence-Rome	Frecciargento	2
Bolzano-Trento-Verona-Bologna-Florence-Rome-Naples	Frecciargento	8 [7]
Mantova-Carpi-Modena-Bologna-Florence-Rome	Frecciargento	1
Genoa-La Spezia-Pisa-Florence-Rome	Frecciargento	1
Rome-Naples-Salerno-Paola-Lamezia-Reggio di Calabria	Frecciargento	2
Rome-Caserta-Benevento-Foggia-Barletta-Bari-Brindisi-Lecce	Frecciargento	4 [8]
Rome-Bari	Frecciargento	1
Milan/Turin-Piacenza-Bologna-Rimini-Falconara-Ancona-Pescara-Foggia-Bari-Lecce/Taranto	Frecciabianca	10 [9]
Venezia-Padua-Bologna-Rimini-Ancona-Pescara-Foggia-Bari-Lecce	Frecciabianca	2
Milan/Turin-Genoa-La Spezia-Pisa-Rome	Frecciabianca	6 [10]
Rome-Naples-Salerno-Lamezia-Reggio di Calabria	Frecciabianca	2
Ravenna-Rimini-Falconara Maritima-Terni-Rome	Frecciabianca	1
TOTAL (Frecciarossa+Frecciargento)		117
TOTAL		138

According to the timetables for the first week of June 2018 on an average weekday.
[1] 1 begins in Brescia, 18 in Turin and 34 in Milan; 1 ends in Florence, 1 in Perugia, 18 in Rome, 24 in Naples, 8 in Salerno and 1 in Taranto.
[2] These services are included in the number of daily departures immediately above. 6 begin in Turin and 9 in Milan; 7 end in Rome and 8 in Naples.
[3] 1 begins in Udine and 12 in Venice; 7 end in Rome and 5 in Naples.
[4] 2 begin in Udine, 4 in Trieste and 17 in Venice; 13 end in Milan, 9 in Turin and 1 in Genoa. 2 additional Eurocity trains operate Venice-Padua-Vicenza-Verona-Brescia-Milan-(…)-Geneva/Zürich.
[5] 1 ends in Pescara and 1 in Bari.
[6] 1 begins in Trieste; 2 end in Fiumicino Airport.
[7] 3 begin in Bolzano, 5 in Verona; 3 end in Rome.
[8] 1 ends in Foggia.
[9] 9 begins in Milan, 1 in Turin; 3 end in Ancona, 1 in Bari, 5 in Lecce and 1 in Taranto.
[10] 1 begins in Milan, 1 in Turin and 4 in Genoa.
Source: own analysis with data from Trenitalia (updated in April 2018).

1.3 Levels of On-Board Service

Frecciargento and Frecciabianca services offer the traditional First and Second classes, while Frecciarossa services have adopted a different scheme, offering four levels of service: Executive, Business, Premium and Standard (from the most exclusive to the most affordable). It can be assumed that Business is equivalent to First class and Standard is equivalent to Second class. An insight into Frecciarossa classes is presented below (Figures 4 to 7).

Figure 4. Executive class on the ETR 400.
Source: International Railway Journal.

Figure 5. Business class on the ETR 400.
Source: mattiachiaruttini.com.

Figure 6. Premium class on the ETR 400.
Source: TripAdvisor.

Figure 7. Standard class on the ETR 400.
Source: Gazzetta dei Trasporti.

1.4 Fares

Trenitalia's HSR services standard fares include Base, Economy, Super Economy tickets, the Young offer and the Senior offer (from the most flexible to the least flexible), which are presented below (Table 19). All of them are available in all levels of service except of the Young offer and the Senior offer, which are not available for Executive.

Table 19 | Frecce HSR Services Standard Fares.

Offer		Standard / Second	Premium	Business / First	Executive
Base	Modify Date/Hour: Free Ticket changes: Free Refund: Allowed, subject to a deduction	Yes	Yes	Yes	Yes
Economy	Modify Date/Hour: Allowed upon payment of a change fee Ticket changes: Not allowed Refund Fee: Not refundable	Yes	Yes	Yes	Yes
Super Economy	Modify Date/Hour: Not allowed Ticket changes: Not allowed Refund Fee: Not refundable	Yes	Yes	Yes	Yes
Senior (>60 years old)	Modify Date/Hour: Not allowed Ticket changes: Not allowed Refund Fee: Not refundable	Yes	Yes	Yes	No
Young (<30 years old)	Modify Date/Hour: Not allowed Ticket changes: Not allowed Refund Fee: Not refundable	Yes	Yes	Yes	No

Source: own elaboration with data from Trenitalia.

Apart from the standard fares listed above, Trenitalia has a wide range of additional offers with specific conditions, such as Same day return, Carnet 10 journeys, Family, Weekend return, 2x1 special, Special 3x2, Group Travel, Green and Silver cards and Night & AV. Furthermore, Trenitalia has its own loyalty programme, called CartaFRECCIA.

1.5 Rolling Stock

Trenitalia's fleet of HSTs and their main characteristics are presented below (Table 20).

Table 20 | Frecce Fleet of HSTs.

Class	E 414 trainset [1]	ETR 400	ETR 460/463	ETR 470
Manufacturer	Trevi [2]	Hitachi Rail Italy (AnsaldoBreda), Bombardier	Fiat Ferroviaria	Fiat Ferroviaria, Schindler, Vevey Technologies
Axle formula	EMU-12	EMU-8	EMU-9	EMU-9
Entered in service	1996 (refurbished in 2006-2008)	2015-	1994	1996
Units produced	60	50	10	9
Commercial service	Frecciabianca	Frecciarossa	Frecciabianca	Frecciabianca
Car formation	2 First class, 1 Second class+Bar, 6 Second class	1 Executive, 1 Business, 1 Busines+Bar, 1 Premium, 3 Standard	3 First class, 1 Bar, 5 Second class	3 First class, 1 Bar, 5 Second class
Capacity	605	457	480	475
Seat configuration		10 Executive, 69 Business, 76 Premium, 300 Standard	137 First class, 341 Second class	151 First class, 322 Second class
Length (m)	20,2 (single locomotive)	202,0	236,0	236,6
Weight (loaded) (t)	136 (2 locomotives, cars not included)	500	445	460
Maximum speed (km/h)	200	300	250	200
Traction [3]	Concentrated (8/44)	Distributed (16/32)	Distributed (24/36)	Distributed (24/36)
Power output (kW)	8.800	9.800	5.880	5.880
Electric systems	3 kV DC	1.5 kV DC, 3 kV DC, 15 kV 16,7 Hz, 25 kV 50 Hz	3 kV DC	3 kV DC, 15 kV 16,7 Hz
Signaling systems	SCMT	ETCS	SCMT	SCMT

Class	ETR 485	ETR 500	ETR 600
Manufacturer	Fiat Ferroviaria	Trevi [2]	Alstom
Axle formula	EMU-9	EMU-13	EMU-7
Entered in service	1997 (refurbished in 2005)	2000-2005 (refurbished in 2012)	2008
Units produced	15	59	12
Commercial service	Frecciargento	Frecciarossa	Frecciargento
Car formation	3 First class, 1 Bar, 5 Second class	1 Executive, 3 Business, 1 Business+Bar, 1 Premium, 5 Standard	2 First class, 1 Second class+Bar, 4 Second class
Capacity	480	574	432
Seat configuration	139 First class, 341 Second class	8 Executive, 91 Business, 67 Premium, 408 Standard	100 First class, 332 Second class
Length (m)	237,0	327,6	187,4
Weight (loaded) (t)	422	640	443
Maximum speed (km/h)	250	300	250
Traction [3]	Distributed (24/36)	Concentrated (8/52)	Distributed (16/28)
Power output (kW)	5.880	8.800	5.600
Electric systems	3 kV DC, 25 kV 50 Hz	3 kV, 25 kV	3 kV DC, 25 kV 50 Hz
Signaling systems	SCMT, ETCS	SCMT, ETCS	SCMT, ETCS

[1] E 414 trainsets are fixed-formations featuring two E 414 locomotives and 9 Gran Comfort/UIC Z1 cars (E 414 + 9 cars + E 414).
[2] Trevi: consortium formed by Ansaldo, Breda, Fiat Ferroviaria, ABB Tecnomasio and Firema Trasporti.
[3] Numbers in parenthesis indicate the number of powered axles with respect to the total number of axles. In trainsets with concentrated propulsion, the two power cars always account for 8 powered axles.
Source: own analysis with data from UIC, Railfaneurope, Wikipedia and others.

With respect to Frecciabianca services rolling stock, E 402B class electric locomotives have been added to the fleet with fixed formations of 9 UIC Z1 class cars (including a pilot car). Each train series is illustrated below (Figures 8 to 15).

Figure 8. E 414 class locomotive on an ordinary Frecciabianca. Source: Maurits90 (Wikipedia).

Figure 9. ETR 400. Source: Simo483 (flickriver).

Figure 10. ETR 463. Source: Mario Serrano (iPdT community).

Figure 11. ETR 470. Source: Russo Vincenzo (Ferrovie.info).

Figure 12. ETR 485 in Bolzano.
Source: Vale93b (Wikipedia).

Figure 13. ETR 500 at Milan Lambrate.
Source: Simone Aveta (flickr).

Figure 14. ETR 600.
Source: FS (flickr).

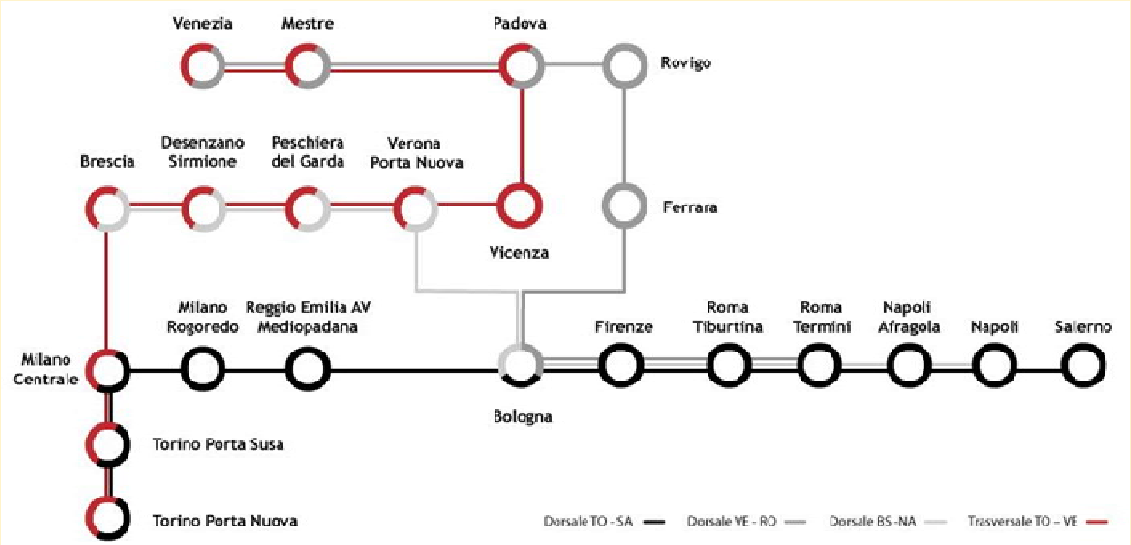
Figure 15. E 402B class locomotive pulling an ordinary Frecciabianca service.
Source: Mitch Schlosser (Bahnbilder).

Appendix 2 | Italo High-Speed Rail Offer

2.1 Network

Italo's HSR and Italobus services network are presented below (Exhibit 45).

Exhibit 45 | Italo HSR and Italobus Services Network.



Source: Italo S.p.A. (updated in May 2018).

2.2 Service List

The current Italo HSR services are detailed below (Table 21).

Table 21 | List of Italo HSR Services.

Route (from north to south and from east to west)	Category of service	Daily departures in each direction
Turin-Milan-Reggio Emilia AV-Bologna-Florence-Rome-Naples-Salerno	Italo	26 [1]
Turin-Milan-Rome-Naples-Salerno (non-stop between Milan and Rome)	Italo	9 [2]
Venice-Padua-Rovigo/Ferrara-Bologna-Florence-Rome-Naples	Italo	8 [3]
Brescia-Verona-Bologna-Florence-Rome-Naples	Italo	3 [4]
Venice-Padua-Vicenza-Verona-Peschiera-Desenzano-Brescia-Milan-Turin	Italo	5 [5]
TOTAL		42

According to timetables for the first week of June 2018, on an average weekday.
Note: Italo timetables are not fully symmetrical when comparing north-south and south-north directions.
[1] 9 begin in Turin, 16 in Milan; 12 end in Rome, 9 in Naples and 4 in Salerno.
[2] These services are included in the number of daily departures immediately above. 6 end in Rome, 2 in Naples and 1 in Salerno.
[3] 4 end in Rome and 4 in Naples.
[4] 1 ends in Verona and 2 in Brescia.
[5] 2 end in Milan and 3 in Turin. From July, increase to 7 daily roundtrips.
Source: own elaboration with data from Italo (updated in May 2018).

2.3 Levels of on-board service

Italo offers up to four level of service: Club Executive, Prima, Comfort (only if operated by AGV trains) and Smart (from the most exclusive to the most affordable), which are illustrated below (Figures 16 to 19).

Figure 16. Club Executive ambience on an AGV trainset. Source: italotreno.it.

Figure 17. Prima ambience on an EVO trainset. Source: italotreno.it.

Figure 18. Comfort ambience on an AGV trainset. Source: italotreno.it.

Figure 19. Smart ambience on an AGV trainset. Source: italotreno.it.

2.4 Fares

Italo standard fares include Flex, Economy and Low Cost tickets (from the most flexible to the least flexible), which are presented below (Table 22). All of them are available in all levels of service except of Low Cost, which is not available for Club Executive.

Table 22. Italo HSR Services Standard Fares.

Offer		Smart	Comfort	Prima	Club Executive
Flex	Change name: Free Modify Date/Hour: Free Refund Fee: Deduction 20%	Yes	Yes	Yes	Yes
Economy	Change name: Free Modify Date/Hour: Supplement 20% Refund Fee: Deduction 40%	Yes	Yes	Yes	Yes
Low Cost	Change name: Free Modify Date/Hour: Supplement 50% Refund Fee: Not refundable	Yes	Yes	Yes	No

Source: own elaboration with data from Italo.

Apart from the standard fares listed above, Italo has a wide range of additional offers with specific conditions: the Day return ticket, the Day return ticket Milan-Rome, Italo Family, Italo Senior, Carnet Italo, Business Pass and Group Travels. Furthermore, Italo has its own loyalty programme, called *Italo Più*.

2.5 Rolling Stock

Italo's fleet of HSTs and their main characteristics are presented below (Table 23).

Table 23. Italo Fleet of HSTs.

Class	ETR 575	ETR 675
Manufacturer	Alstom	Alstom
Axle formula	EMU-11	EMU-7
Entered in service	2012-2013	2017-2019
Units produced	25	17
Car formation	1 Club, 2/3 Prima, 1/2 Comfort, 6 Smart [1]	1 Club/Prima, 1 Prima, 4 Smart
Capacity	462 (450 initially)	478
Seat configuration (original)	19 Club, 143 Prima, 288 Smart	19 Club, 128 Prima, 331 Smart
Cost (M€)	26	21,5
Seat cost (€/seat)	57.777,78	44.979,08
Length (m)	201,2	187,3
Weight (loaded) (t)	423,0	400,0
Maximum speed (km/h)	300	250
Traction	Distributed (10/24)	Distributed (16/28)
Power output (kW)	7600	5664
Wheelbase (m)	3,00	2,70
Electric systems	25 kV 50 Hz, 3 kV DC	25 kV 50 Hz, 3 kV DC
Signaling systems	SCMT, ETCS	SCMT, ETCS

[1] Number of Prima and Comfort cars can be adapted to meet demand.
Source: own elaboration with data from Da Zero a Italo. Così è nata la concorrenza (2013), UIC, Railfaneurope, Wikipedia and others.

Each train series and the Italobus are illustrated below (Figures 20 to 22).

Figure 20. NTV AGV train.
Source: raileurope.hk.

Figure 21. NTV EVO train at Rho Fiera.
Source: Flickr Lorenzo Corci.

Figure 22. Italobus.
Source: trasporti-italia.com

Appendix 3 | Other Data

3.1 Italo Key Metrics and Financial Results

Italo data presented in Section 6.2 is collected below (Table 24).

Table 24. Summary of Italo Key Metrics and Financial Results.

Concept	2011	2012	2013	2014	2015	2016	2017
Traffic revenue (M€)			239,5	261,5	303,9	350,5	414,9
Total revenue (M€)			249,6	267,8	322,4	380,3	454,9
Production costs (M€)			327,1	329,6	308,8	323,3	342,4
EBITDA (M€)			-34,5	-13,7	61,5	96,2	142,0
EBITDA Margin (%)			-13,8%	-5,1%	19,1%	25,3%	31,2%
Net income (M€)			-77,6	-62,0	-12,6	28,2	33,8
Profit Margin (%)			-31,1%	-23,1%	-3,9%	7,4%	7,4%
Production of train.km (Mtrain.km)			11,6	11,8	12,3	13,9	14,9
Production of train.km per unit (train.km)			462.908	473.796	492.000	556.000	587.200 [1]
Ridership (Mpax)		2,1	6,2	6,6	9,1	11,1	12,8
Average distance travelled (km)			425,0	420,0	434,9	430,5	415,5
RPK (Mpax.km)		900,0	2.634,5	2.752,7	3.957,5	4.778,8	5.318,7
ASK (Mseat.km)			5.207,7	5.330,2	5.535,0	6.255,0	6.871,7
Load factor (%)			50,6%	51,7%	71,5%	76,4%	77,4%
Yield (€/RPK)			0,091	0,095	0,077	0,073	0,078
RASK (€/ASK)			0,046	0,049	0,055	0,056	0,060
CASK (€/ASK)			0,063	0,062	0,056	0,052	0,050
Frecce Ridership (Mpax)	37,9	39,8	42,0	51,4	55,0	57,2	
Frecce+Italo Ridership (Mpax)	37,9	41,9	48,2	58,0	64,1	68,3	
Frecce RPK (Mpax.km)	14.100	14.000	14.600	15.100	15.900	15.200	
Frecce+Italo RPK (Mpax.km)	14.100	14.900	17.235	17.853	19.858	19.979	

[1] Adjusted.
Source: own elaboration with data from Italo, Trenitalia and others.

3.2 Air Traffic in Domestic Inland Air Links

All the data used in Section 7.2 is collected below (Table 25).

Table 25. Air Traffic in Italian Domestic Links with HSR Service in Competition.

Route (from south to north)	Air links	2009	2010	2011	2012	2013	2014	2015	2016	2017
Rome-Milan	Rome Fiumicino-Milan Linate	1.720.951	1.522.817	1.522.184	1.379.567	1.416.886	1.455.244	1.366.450	1.189.185	1.183.753
	Rome Fiumicino-Milan Malpensa	671.396	683.081	674.836	600.620	454.569	332.226	317.286	291.701	NA
	Rome Fiumicino-Bergamo	NA	105.277	108.550	NA	NA	NA	NA	NA	NA
	Rome Ciampino-Bergamo	406.331	317.729	326.714	288.618	238.017	NA	NA	NA	NA
	Total Rome-Milan	**2.798.678**	**2.628.904**	**2.632.284**	**2.268.805**	**2.109.472**	**1.787.470**	**1.683.736**	**1.480.886**	**1.183.753**
Naples-Milan	Naples-Bergamo Orio al Serio	NA	NA	NA	NA	NA	NA	NA	NA	312.389
	Naples-Milan Linate	728.499	674.851	672.468	689.663	633.345	635.221	597.186	481.905	509.251
	Naples-Milan Malpensa	572.653	703.031	702.984	640.752	505.955	444.365	435.226	349.972	355.582
	Total Naples-Milan	**1.301.152**	**1.377.882**	**1.375.452**	**1.330.415**	**1.139.300**	**1.079.586**	**1.032.412**	**831.877**	**1.177.222**
Rome-Turin	**Rome Fiumicino-Turin**	**869.564**	**884.068**	**940.279**	**879.721**	**663.741**	**619.130**	**670.016**	**638.229**	**550.244**
Rome-Venice	Rome Fiumicino-Venice Marco Polo	743.470	794.066	787.769	729.233	619.131	527.642	552.997	540.397	500.485
	Rome Ciampino-Treviso	202.834	NA	NA	NA	NA	NA	NA	NA	NA
	Total Rome-Venice	**946.304**	**794.066**	**787.769**	**729.233**	**619.131**	**527.642**	**552.997**	**540.397**	**500.485**
Naples-Venice	Naples-Venice Marco Polo	296.859	327.301	333.403	395.100	313.378	290.568	247.366	305.440	320.618
	Naples-Treviso	NA	NA	NA	NA	NA	NA	NA	NA	166.287
	Total Naples-Venice	**296.859**	**327.301**	**333.403**	**395.100**	**313.378**	**290.568**	**247.366**	**305.440**	**486.905**
Naples-Rome	**Naples-Rome Fiumicino**	**269.809**	**279.968**	**311.409**	**280.187**	**275.680**	**289.965**	**299.854**	**326.541**	**295.159**
Naples-Turin	**Naples-Turin**	**321.800**	**311.922**	**318.368**	**300.179**	**231.436**	**255.715**	**216.794**	**240.429**	**278.128**
Rome-Florence	**Rome Fiumicino-Florence**	**211.968**	**226.077**	**236.273**	**232.357**	**223.510**	**196.884**	**214.489**	**228.543**	**247.498**
Rome-Bologna	**Rome Fiumicino-Bologna**	**226.653**	**222.531**	**249.422**	**232.683**	**211.434**	**238.796**	**207.848**	**253.531**	**235.105**
Rome-Verona	**Rome Fiumicino-Verona**	**384.104**	**337.190**	**287.849**	**248.911**	**211.521**	**198.981**	**187.080**	**195.967**	**177.129**
Naples-Verona	**Naples-Verona**	**151.513**	**153.838**	**147.491**	**114.564**	**107.575**	NA	NA	NA	NA
Naples-Bologna	**Naples-Bologna**	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total		**7.778.404**	**7.543.747**	**7.619.999**	**7.012.155**	**6.106.178**	**5.484.737**	**5.312.592**	**5.041.840**	**5.131.628**

Source: own elaboration with data from ENAC.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